الاتحاد الكيميائى

# Chemical combination

الذرة والايون

المادة تتكون من جزيئات التى تتكون من ذرات – الذرة متعادلة كهربيا لان عدد البروتونات = عدد الالكترونات

الايون : عبارة عن ذرة اكتسبت او فقدت الكترونات (metals تفقد الكترونات متحولة لايون موجب – non metals العكس)

## The atom and the ion

*You know : matter is composed of molecules and each molecule consists of very smaller units called **atoms**.*

*The atom is electrically neutral in its ordinary state.*
*In the atom, the number if electrons equals the number of protons.*
*The number of known elements up till now is 112 elements.*

العناصر عددها 112 – تنقسم الى فلزات – لا فلزات – غازات خاملة

*Elements can be classified according to their prosperities and electronic structure in to*

Metals　　Non- metals　　Noble gases

## 1 – Metals

الفلزات : تملك اقل من 4 الكترونات فى مستوى الطاقة الاخير – صلبة ماعدا الزئبق (سائل) – لها بريق – موصل جيد للحرارة والكهرباء – لها القدرة ع التشكيل

**They are the elements which have less than (4) electrons in the outermost energy level.**



### * The prosperities of metals:

**1) They are solids (except mercury (Hg) which is the only liquid metallic element).**

**2) They have metallic luster.**

**3) They are good conductors to heat and electricity.**

**4) They are malleable and ductile.**

فى التفاعل الكيميائى ذرة الفلز تعطى (تفقد) الالكترونات الخارجية لذرة اخرى متحولة لايون موجب (عدد البروتونات اصبح اكبر من الالكترونات)

تحمل عدد الشحنات الموجبة = عدد الالكترونات المفقودة

**** During the chemical reaction, atoms metals tend to give (lose) their outermost electrons to other atoms and change into positive ions which carry a number of positive charges to the number of the given electron (s).**

**Positive ion**

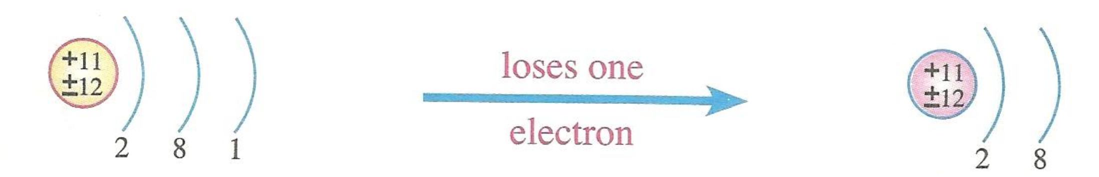
**It is the atom which loses (give) an electron or more during the chemical reaction**



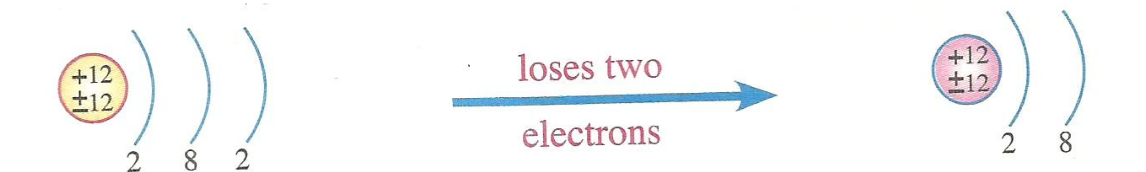


***Examples of metals atoms***

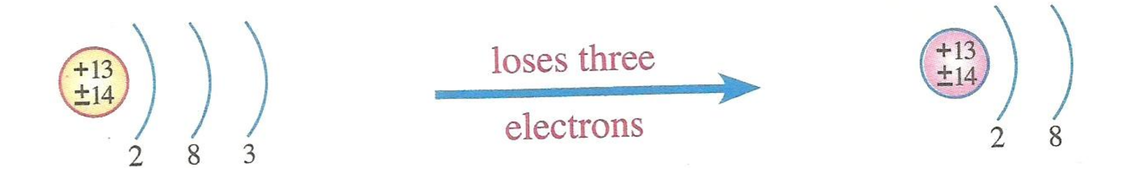
**Example 1 : Sodium atom Na loses one electron and changes into a positive ion $Na^{+}$**




**Example 2 : magnesium atom Mg loses two electrons and changes into a positive ion $Mg^{2+}$**




**Example 3 : aluminum atom Al loses three electrons and changes into a positive ion $Al^{+3}$**






**G.R When the atom loses an electron or more during the chemical reaction, it changes to a positive ion ?**

**Because the number of electrons becomes less than the number of protons.**

## 2 – Non-metals

**اللافلزات : تملك اكثر من 4 الكترونات فى مستوى الطاقة الاخير – صلبة غاز ماعدا البروم (سائل) – ليس لها بريق – رديئة التوصيل للحرارة والكهرباء ماعدا الكربون – ليس لها القدرة ع التشكيل**

*They are the elements which have more than (4) electrons in the outermost energy level.*



## ** The prosperities of non metals:*

1) They are solids and gases {except bromine (Br) which is the only liquid non- metallic element}.
2) They have no luster.
3) They are bad conductors to heat and electricity {except graphite (carbon). Which is a good conductor to electricity}.
4) They are not malleable or ductile.








فى التفاعل الكيميائى ذرة اللافلز تكتسب الكترونات من ذرة اخرى لتكمل المستوى الاخير بالالكترونات (8) او (2) فى ذرة الهيليوم متحولة لايون سالب (عدد الالكترونات اصبح اكبر من البروتونات) تحمل عدد الشحنات السالبة = عدد الالكترونات المكتسبة

## During the chemical reaction,

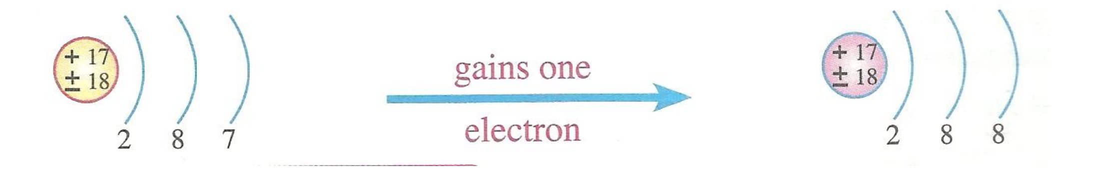
**Atoms of non-metals tend to gain electrons from other atom to complete their outermost energy level and change into negative ions which carry a number of negative charges to the number of the gained electron (s).**

> ***Negative ion***
> **It is the atom which gains an electron or more during the chemical reaction.**

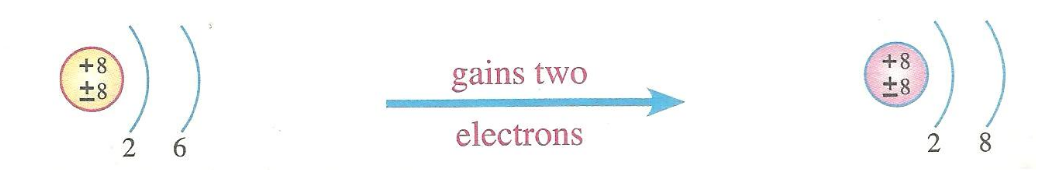


## *Examples of non metals atoms*

**Example 1 : chlorine atom Cl gains one electron and changes into a negative ion $Cl^-$**




**Example 2 : oxygen atom O gains two electrons and changes into a negative ion $O^{-2}$**




**Examples 3 : nitrogen atom N gains three electrons and changes into a negative ion $N^{-3}$**



**G.R When the atom gains an electron or more during the chemical reaction, it changes to a negative ion?**
Because the number of electrons becomes more than the number of protons.

> ***Note***
> *Hydrogen 1H has only one electron in the outermost energy level (k level), but it is not considered from metals, it is a gaseous nonmetal element.*

> **The ion:** الايون : هو ذرة فقدت او اكتسبت الكترون او اكثر فى التفاعل الكيميائى
> **It is the atom which loses or gains and electron or more during the chemical reaction.**








## 3 – Noble (inert) gases:

الغازات الخاملة : عناصر مستوى الطاقة الاخير كامل بالالكترونات – لذلك لا تشارك فى التفاعل الكيميائى – يتكون الجزئ من ذرة واحدة – لا تكون ايون موجب او سالب

**They are elements in which the outermost levels are full with electrons.**
**So they don't participate in any chemical combination in ordinary conditions**
**Therefore:**

- **Each molecule consists of one single atom (monoatomic).**
- **They don't form positive or negative ions in the ordinary conditions.**

| The atom of The inert gases | No. Of electrons | No. Of protons | No. Of neutrons | Electronic configuration |
|---|---|---|---|---|
| $^{4}_{2}He$ | 2 | 2 | 2 | +2 ±2 — 2 |
| $^{20}_{10}Ne$ | 10 | 10 | 10 | +10 +10 — 2 8 |
| $^{36}_{18}Ar$ | 18 | 18 | 18 | +18 ±18 — 2 8 8 |

*Complete the following table:*

| Element | Electronic configuration | Type | Type of ion | Electronic configuration of ion |
|---|---|---|---|---|
| $_{7}N$ | 2 5 | Non metal | Negative | 2 8 |
| $_{11}Na$ | | | | |
| $_{13}Al$ | | | | |
| $_{8}O$ | | | | |
| $_{17}Cl$ | | | | |
| $_{18}Ar$ | | | | |










## * Comparison between the atom and the ion:

| The atom | The ion |
|---|---|
| Electricity neutral in ordinary state. | Charged (positive and negative ions). |
| The number of electrons equals the number of protons. | The number of electrons is more than or less than that of protons. |

## * Comparison between metals and non-metals:

| Metals | Non-metals |
|---|---|
| They have less than (4) electrons in the outermost energy level. | They have more than (4) electrons in the outermost energy level. |
| They are solids (except mercury (Hg) which is a liquid). | They are solids and gases (except bromine (Br) which is a liquid). |
| They have metallic luster. | They have no luster. |
| They are malleable مرن and ductile.قابل للسحب | They are not malleable or ductile. |
| They are good conductors of heat and electricity. | They are bad conductors of heat and electricity. (Except graphite that is a good conductor of electricity). |

## * Comparison between positive ion and negative ion:

| Positive ion (cation) | Negative ion (anion) |
|---|---|
| It is an atom of metallic element | It is an atom of non- metallic element |
| It carries positive charges equal to the number of the lost electrons. | It carries negative charges equal to the number of the lost electrons. |
| The number of its electrons is less than the number of protons inside the nucleus. | The number of its electrons is more than the number of protons inside the nucleus. |
| The number of its energy levels is less than that of its atom. | The number of its energy levels is equal to that of its atom. |










الروابط الكيميائية



# Chemical bonds

الذرات تتحد مكونة الجزيئات عن طريق الروابط الكيميائية (الرابطة الايونية – الرابطة التساهمية)

*Atoms combine with each other forming molecules through "Chemical bonds".*
*We will study two types of bonds which are:*

الرابطة الايونية تنشأ نتيجة قوى التجاذب بين الايون الموجب والايون السالب (فلز - لافلز)
الرابطة التساهمية تنشأ نتيجة مشاركة كل ذرة بعدد متساوى من الالكترونات (لافلز - لافلز )

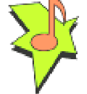
1 - Ionic bond        2 - Covalent bond

## 1 – Ionic bond

It is type of chemical bonds that occurs between a metal atom and non-metal atom.

**Ionic bond**
It is a bond that is resulted from the electrical attraction between a positive ion and a negative ion.

يفقد الفلز الكترون او اكثر متحولا الى ايون موجب – اللافلز يكتسب الكترون اواكثر متحولا الى ايون سالب – نتيجة التجاذب تتكون رابطة ايونية بين الذرتين



### How is ionic bond formed?

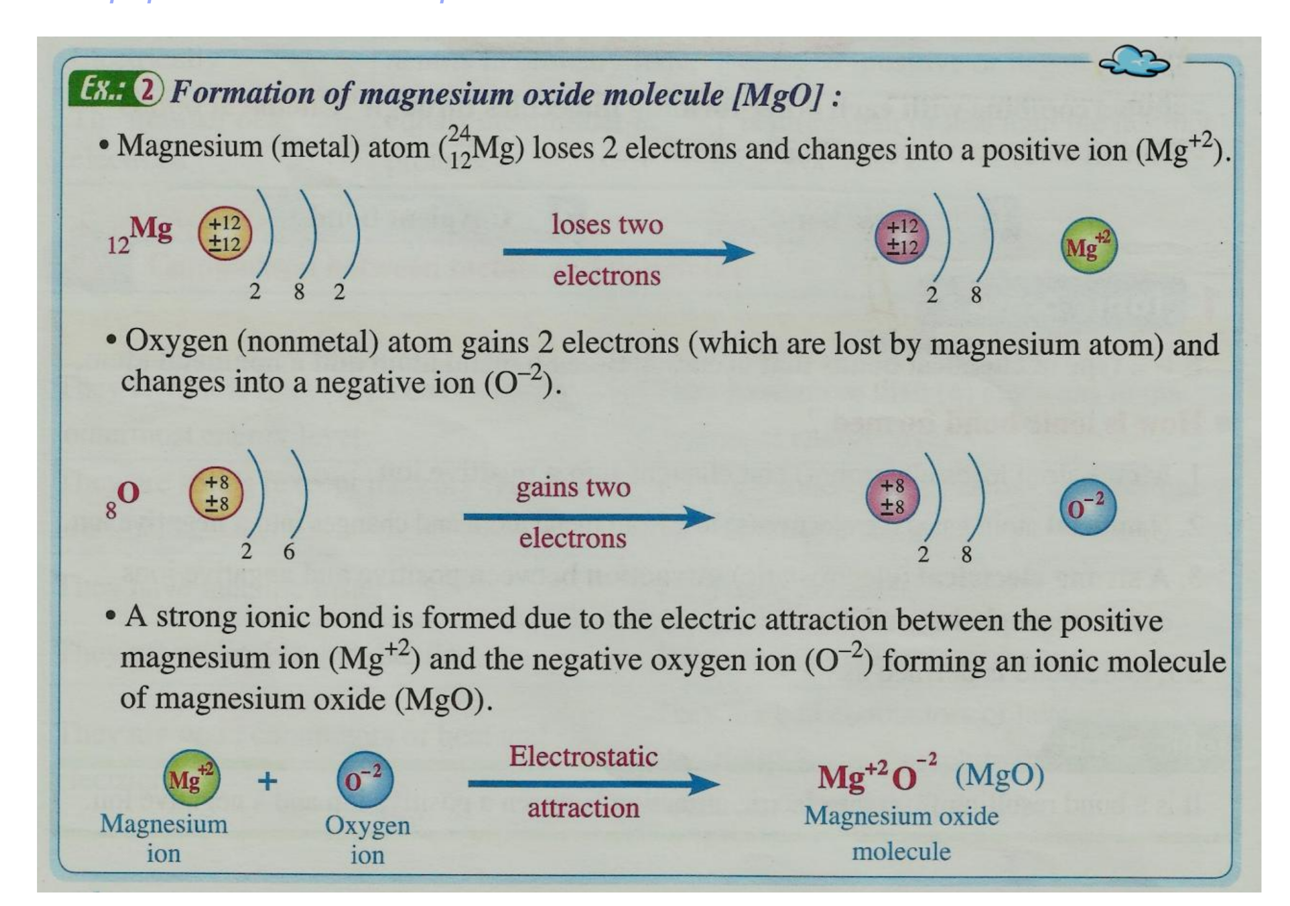
1 - Metal atom loses one electron and changes into a positive ion.
2 -Non-metal atom gains the electron lost from metal atom and changes into a negative ion.
3 -A strong electrical (electrostatic) attraction between positive and negative ions occurs through the ionic bond.

الروابط الايونية تنتج مركبات ايونية فقط وليس عناصر لانها تنشأ بين عناصر مختلفة (فلز – لا فلز)

**Note:**
- G.R Ionic bonds produce compounds only not elements
  Bec. ionic bond arises between two different elements (metal & nonmetal )
- ionic bonds produce ionic compounds.



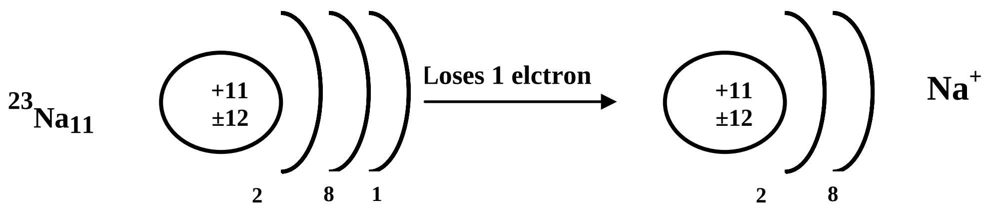




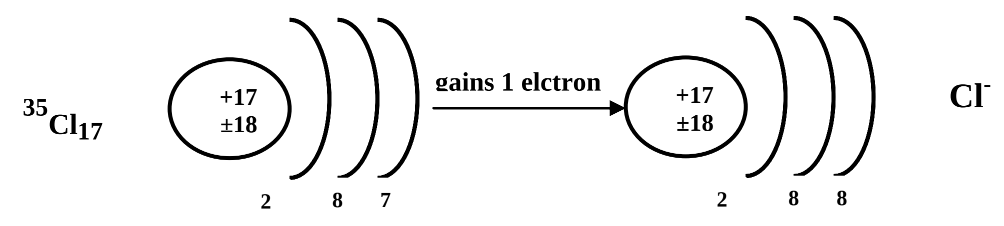

## Example 2

**Formation of Sodium chloride molecule (NaCl)**

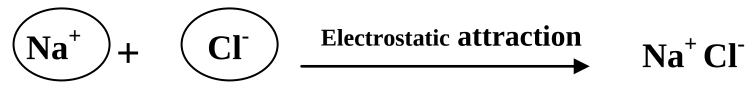
*Sodium $^{23}Na_{11}$ loses one electron and changes into a positive ion $Na^+$*




*Chlorine $^{35}Cl_{17}$ gains one electron and changes into a negative ion $Cl^-$*




*A strong bond is formed due to the electrical attraction between positive sodium ion $Na^+$ and negative chloride ion $Cl^-$ forming an ionic molecule Na Cl (sodium chloride)*











## 2 – Covalent bond

تنشأ بين ذرتين لافلز

It is a type of bonds that occurs between two non-metal atom,

كل ذرة تشارك بعدد من الالكترونات (مستوى الطاقة الاخير) لتجعل المستوى الاخير للذرتين كامل – مكونة جزئ تساهمى

*So, covalent bond is defined as:*

**Covalent bond**

It is a bond that is resulted among the atoms of non-metals through the participation (share) of each atom with a number of electrons equal to the number that completes the outer electron shell.

انواع الرابطة التساهمية : احادية : تشارك كل ذرة ب 1 الكترون – ثنائية :تشارك ب 2 الكترون – ثلاثية تشارك ب 3 الكترون

### Types of covalent bond

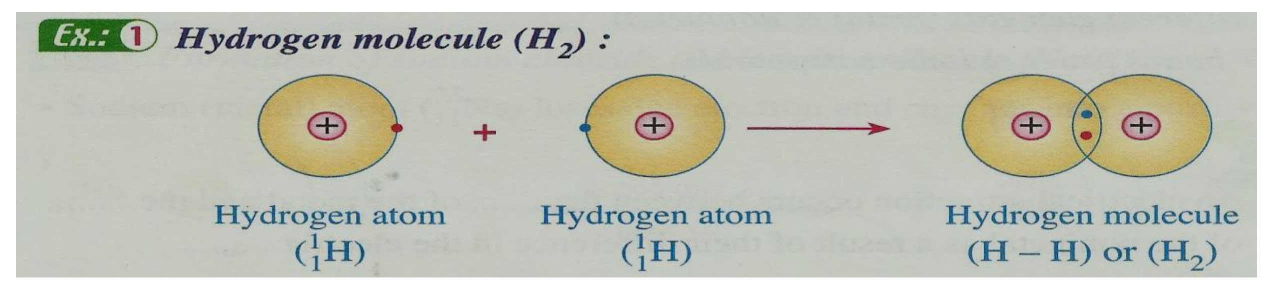
Single | Double | Triple

### 1- Single covalent bond

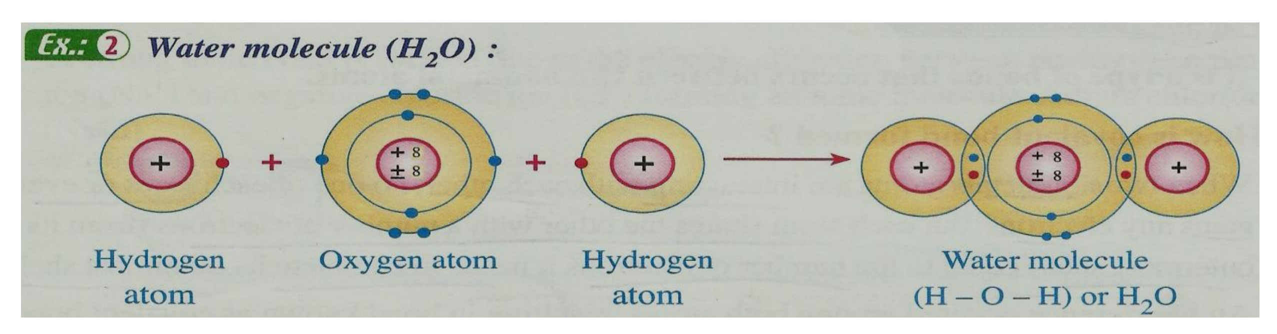
*It is the bond which arises تنشأ between two non-metal atom , where each atom shares other atom with **one** electron*

It is represented by one line ( -) joining the two atoms.

لاحظ ان : كل ذرة هيدروجين شارك ب 1 الكترون ليكمل K ب 2 الكترون




الاكسجين شارك ب 2 الكترون (كل ذرة هيدروجين 1 الكترون) ليكمل مستوى طاقته 8 – ويكمل الهيدروجين 2 الكترون









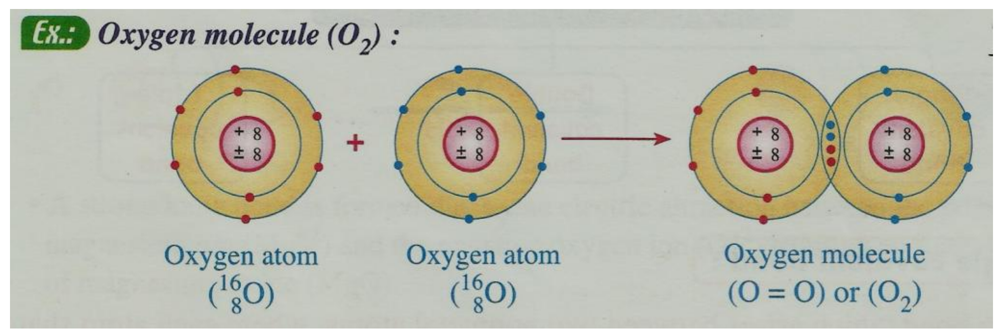
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## 2 - Double covalent bond

It is the bond which arises تنشأ between two non-metal atom , where each atom shares other atom with **two** electron

كل ذرة اكسجين تشارك 2 الكترون ليكمل كل مستوى طاقة 8 الكترونات



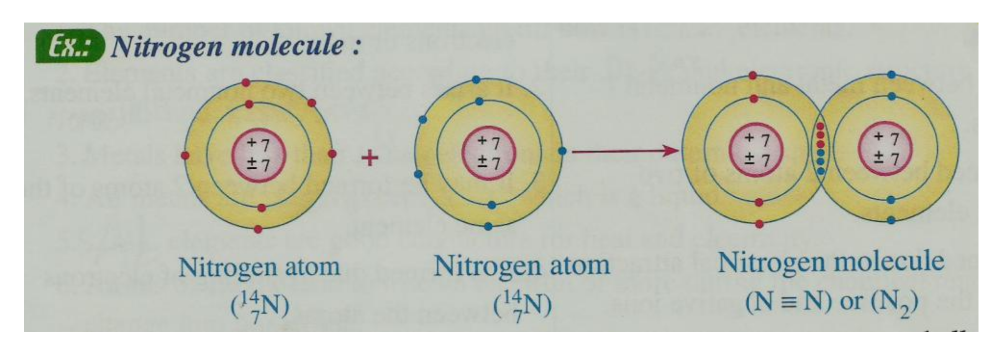

*It is represented by two lines (=) joining the two atoms.*

## 3 - Triple covalent bond

It is the bond which arises between two non-metal atoms, where each atom shares the other atom with **three** electrons.

*It is represented by three lines ( ≡) joining the two atoms.*

كل ذرة نيتروجين تشارك 3 الكترونات لتكمل مستوى الطاقة الاخير 8 الكترونات




لاحظ ان الاكسجين يملك 6 الكترونات فى مستوى الطاقة الاخير (يشارك 2 ليكمل 8) – النيتروجين يملك 5 الكترون فى مستوى الطاقة الاخير (يشارك3 ليكمل 8)



## Covalent bonds produce elements and compounds

- *Element molecules between two non-metallic similar atoms.*
- *Compound molecules between two different nonmetallic atoms.*

*** Covalent bonds produce covalent compounds.*







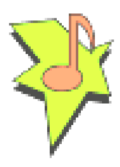



## * Comparison between ionic bond and Covalent bond:

| Ionic bond | Covalent bond |
|---|---|
| It is formed by loss and gain of electrons. | It is formed by sharing of one pair of electrons or more. |
| It arises between metal and non-metal elements. | It arises between two non-metal elements. |
| It is formed between 2 atoms of two different elements. | It may be formed between 2 atoms of two same elements. |
| It is formed due to the electrical attraction between the positive and negative ions. | It is formed due to sharing of electrons between the atoms. |
| It has one type. | It has three types (single, double and triple). |
| It produces compound molecules only. | It produces element and compound molecules. |

المركبات الكيميائية

# Chemical compounds



## The valency

فى التفاعل الكيميائى الذرات تحاول الوصول لحالة الاستقرار (اقرب غاز خامل) لذلك تفقد او تكتسب او تشارك بالالكترونات مع ذرة اخرى – ويعرف عدد الالكترونات التى فقدته او اكتسبته او شاركته الذرة ب التكافؤ **Valency**

***During the chemical reaction, atoms try to reach the stable state. This is by:***

*1-Losing their outermost electrons (as in case of metals).*

*2-Gaining a number of electrons to fulfill the other shell by (8) electrons (as in case of non-metals).*

*3-Sharing number of electrons to other different atoms (as in case of non-metals).*

التكافؤ : عدد الالكترونات التى تكتسب – تفقد – تشارك بها الذرة فى التفاعل الكيميائى

***The valency***

*It is the number of electrons that an atom gained, lost or even shared during a chemical reaction.*

مستوى الطاقة الخارجى هو المحدد للتكافؤ – اذا فقدت اواكتسبت او شاركت الذرة ب (1) الكترون تصبح احادى التكافؤ

اذا فقدت اواكتسبت او شاركت الذرة ب (2) الكترون تصبح ثنائى التكافؤ

اذا فقدت اواكتسبت او شاركت الذرة ب (3) الكترون تصبح ثلاثى التكافؤ



The outermost electronic of an atom determine its valency.

*Electronic configuration of some elements and their valences:*

| Element | Atomic Number | Electronic configuration | | | During chemical reaction | Formed | valency |
|---|---|---|---|---|---|---|---|
| | | K | L | M | | | |
| Sodium ($_{11}Na23$) | 11 | 2 | 8 | 1 | -loses one electron | $Na^+$ | Monovalent |
| Chlorine ($_{17}Cl35$) | 17 | 2 | 8 | 7 | -gain or shares with one electron | $Cl^-$ | Monovalent |
| Oxygen ($_8O16$) | 8 | 2 | 6 | | gain or shares with two electron | $O^{--}$ | Divalent |
| Magnesium ($_{12}Mg24$) | 12 | 2 | 8 | 2 | -loses two electrons | $Mg^{++}$ | Divalent |
| Aluminium ($_{13}Al27$) | 13 | 2 | 8 | 3 | -loses tree electrons | $Al^{+++}$ | Trivalent |

لاحظ ان **metal** تفقد – **non-metal** تكتسب او تشارك









## The valency of some metals:

| Metal | valency | Metal | valency | Metal | valency |
|---|---|---|---|---|---|
| Lithium Li<br>Potassium K<br>Sodium Na<br>Silver Ag<br>Copper 1 Cu | Monovalent | Calcium Ca<br>Magnesium Mg<br>Iron 2 Fe<br>Lead Pb<br>Copper 2 Cu<br>Mercury Hg | Divalent | Aluminum Al<br>Gold Au<br>Iron 3 Fe | Trivalent |

بعض الفلزات لها اكثر من تكافؤ

Note >>> some metallic elements have more than one valency such as:

Copper (Cu) which is **monovalent** and **divalent**.
Also , Iron (Fe) is **divalent** (( ferrous )) and **trivalent** (( Ferric )).



**G.R Sodium ($_{11}$Na) is monovalent, while aluminum ($_{8}$O) is divalent?**
Because sodium atom ( 2,8,1) losses one electron in chemical reaction, while oxygen (2,6 ) gains or share two electrons in chemical reaction .

## The valency of some non metals:

| Nonmetal | valency | Nonmetal | valency |
|---|---|---|---|
| Hydrogen H<br>Chlorine Cl<br>Fluroine F<br>Bromine Br<br>Iodine I | Monovalent | Sulphur S<br>Carbon C | Tetravalent |
| | | Nitrogen N<br>Phosphorus P | Pentavalent |
| Sulphur S<br>Oxygen O | Divalent | Sulphur S | Hexavalent |
| Nitrogen N<br>Phosphorus P | trivalent | | |

بعض اللافازات لها اكثر من تكافؤ

Note >>> some nonmetal elements have more than one valency such as:
** Sulphur S is divalent, tetravalent and Hexavalent.
** Nitrogen N is trivalent and pentavalent.
** Phosphorus P is trivalent and pentavalent.








تكافؤ الغازات الخاملة = صفر لان المستوى الاخير كامل بالالكترونات

## The valency of Nobel gases

*The valiancy of noble gases is zero ?*

*because their outer electron shell is completely filled with electrons (have 8 electrons) {except (2He) has 2 electrons}.*

المجموعة الذرية : مجموعة من الذرات لعناصر مختلفة ترتبط معا تسلك سلوك الذرة الواحدة فى التفاعل الكيميائى ولها تكافؤ خاص

## The atomic group

### The atomic group (Radical)

*It is a set of atoms of different elements joined together behave like one atom during a chemiction , having a special valency electrons and cannot be existed alone*

### Valencies of some atomic groups (radicals)

| Atomic group | valency | Atomic group | valency | Atomic group | valency |
|---|---|---|---|---|---|
| Hydroxide $(OH)^-$<br>Bicarbonate $(HCO3)^-$<br>Nitrate $(NO3)^-$<br>Nitite $(NO2)^-$<br>Ammonium$(NH4)^+$ | Monovalent | Carbonate $(HCO3)^{-2}$<br>Sulphate $(SO4)^{-2}$ | Divalent | Phosphate $(PO4)^{-3}$ | Trivalent |

## Question:

*Mention an example for monovalent atomic group and trivalent atomic group?*
*What are the properties of atomic group?*

Answer

$(NO_3)^-$ is monovalent. / $(PO_4)^{-3}$ is trivalent.

*Atomic group has its own valency, behave like one atom during a chemical reaction and can not be existed alone.*






Ms. Marim



الصيغة الكيميائية : هى صيغة تعبر عن عدد ونوع الذرات فى الجزئ

# Chemical Formula

*We can express the number of atoms and their types by chemical formula:*

**Chemical formula**

It is a formula that represents the number and the type of the atoms in a molecule.



For example:

The chemical formula of sodium chloride (table salt) is NaCl.

*This means that: this compound is composed of two atoms:*

*One atom of Sodium element.*

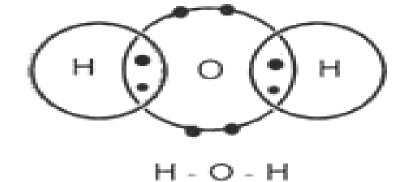
*One atoms of chlorine element.*

## The chemical formula of water is $H_2O$.

*This means that : This compound is composed of three atoms*

*- One atom of Oxygen element .*

*-Tow atom of Hydrogen element .*




## How to write a chemical formula for a compound ?

لكتابة الصيغة الكيميائية – اكتب اسم المركب بالحروف- اكتب رموز العناصر او المجموعة الذرية – اكتب التكافؤ لكل عنصر تحت الرمز تبادل التكافؤ – ضع التكافؤ فى ابسط صورة – لا تكتب تكافؤ (1)

*We follow the following steps :*

| Steps | Calcium oxide | Sodium sulphate | Aluminum oxide |
|---|---|---|---|
| 1 - Write the name of the compound in words.<br>2 - Write the symbol of each element or atomic group down to the name .<br>3 - Write the valence down to each symbol.<br>4 - Exchange their valences and simplify them (shortened as much as possible) .<br>5 - You don't have to write the one (1) | Ca O<br>2 2<br>$Ca_2$ $O_2$<br>1 1<br>Ca O | Na $SO_4$<br>1 2<br>$Na_2$ $(SO_4)_2$<br>$Na_2SO_4$ | Al O<br>2 2<br>$Al_2$ $O_3$<br>$Al_2O_3$ |








توضع المجموعات الذرية داخل اقواس – ويوضع التكافؤ يمين خارج الاقواس

*In case of atomic groups if the number is not (1) Put the atomic group between brackets and write the number right down to it.*

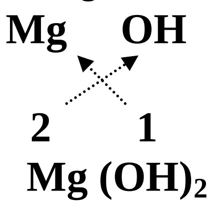
**Such as: 1. Aluminum sulphate**

Al SO4

3 2

$Al_2(SO_4)_2$

**2. Magnesium hydroxide**






*Exercise : write the chemical formula for each of the following molecules and mention the number of forming elements and the number of atoms in each molecule?*

1 - Hydrogen chloride.
2 - sodium Oxide
3 - Carbon dioxide.
4 - sodium hydroxide.
5 -Aluminium carbonate.

| Compound | Chemical formula | No of atoms in the molecule | No. of forming elements. |
|---|---|---|---|
| 1 - Hydrogen chloride. | H Cl<br>1 1<br>$HCl$ | 1 + 1 = 2 | 2 |
| 2 - Sodium Oxide | Na O<br>1 2<br>$Na_2O$ | 1 + 2 = 3 | 2 |
| 3 - Carbon dioxide | C O<br>4 2<br>$CO_2$ | 1 + 2 = 3 | 2 |
| 4 - Sodium hydroxide | Na OH<br>1 1<br>$NaOH$ | 1 + 1 + 1 = 3 | 3 |
| 5 - Aluminium carbonate. | Al $CO_3$<br>3 2<br>$Al_2(CO_3)_3$ | 9 + 3 +2 = 14 | 3 |






Ms. Marim



# Chemical compounds

يوجد عدد لانهائى من المركبات الكيميائية

## Types of compounds

*In nature, there is a countless number of existing compounds.*

العناصر تنقسم طبقا لخواصها الى : احماض – قواعد (قلويات) – اكاسيد - املاح

*Elements can be classified according to their properties into*

1- Acids 2- Bases (alkalis) 3- Oxides 4- Salts

الاحماض : مواد تتفكك فى الماء وتنتج ايونات الهيدروجين الموجبة

## 1 – Acids

**Acids**

*They are substances which dissociate in water producing positive hydrogen ions ($H^+$)*

**Examples for some acids:**

-Hydrochloric acid (HCl)

-Sulphuric acid ($H_2SO_4$)

-Nitric acid ($HNO_3$)

خواص الاحماض : الصيغة الكيميائية تبدأ ب الهيدروجين مرتبط مع محموعة ذرية سالبة (نترات – كبريتات) ماعد الهيدروكسيد لها طعم لاذع – تحول محلول عباد الشمس احمر

## *The properties of acids :

*1-The chemical formula of all mineral acids begin with hydrogen joined with one of negative atomic group (except $OH^-$ group) .*

*2-They have a sour taste.*

*3- They change the colour of litmus paper to be red*

**G.R acids change the color of litmus paper to red color?**

**Due to the presence of the hydrogen ions ($H^+$) .**

*Mineral acids are classified into:*

| A) Oxygenated acids | B) Non –oxygenated acids |
|---|---|
| They are formed when hydrogen joined with one of the negative atomic groups (except $OH^-$ group)<br>Examples :<br>-Sulphuric acid ($H_2SO_4$) .<br>-Nitric acid ($HNO_3$) | They are formed when hydrogen joined with one of negative non-Metal ions such as chlorine ($Cl^-$ ) and bromine ($Br^-$ ).<br>Examples :<br>-Hydrochloric acid (HCl)<br>-Hydrobromic acid (HBr) |






Ms. Marim



# 2 - Bases

القواعد : مواد تتفكك فى الماء وتنتج ايونات الهيدروكسيد السالبة

**Bases**

*They are substances that dissociate in water producing **negative hydroxide ions** (OH-).*

## Examples for some bases:

*Sodium hydroxide (NaOH)*
*Calcium hydroxide Ca(OH)2*
*Potassium hydroxide (KOH)*

خواص القواعد : الصيغة الكيميائية تنتهى ب مجموعة الهيدروكسيد – لها طعم مر وملمس الصابون – تحول محلول عباد الشمس ازرق



## The properties of bases (alkalis):

*1-The chemical formula of all alkalis end with (OH) --group.*
*2-Their aqueous solutions have a bitter taste and feel slippery.*
*3-They change the color of litter paper to be blue*

*Exercise:*

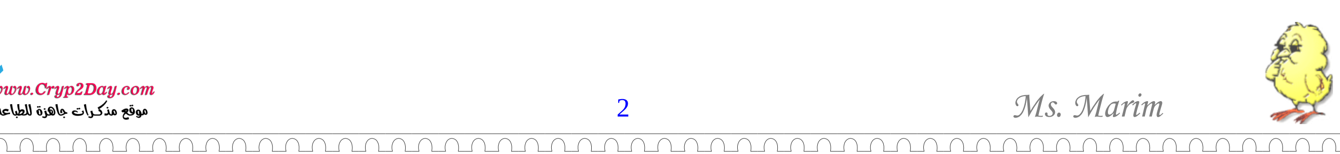
*Having two unmarked tubes, one contains acid and the other contains **acid** and the other contains a **base**. How can you distinguish between them?*

*Answer:*

*Put two litmus paper (red and blue) to each tube.*
*The blue litmus paper becomes **red**, in the tube which contains an **acid**.*
*The red litmus paper changes into **blue**, in the tube which contains the **alkali**.*

## Comparison between acids and bases:

| Acids | Bases |
|---|---|
| They are substances which dissociate in water producing hydrogen ions ($H^+$) | They are substances which dissociate in water producing hydroxide jons ($OH^-$). |
| The symbol of all the mineral acids begins with hydrogen (H). | The symbol of all alkalis ends with (OH) group. |
| They have sour taste. | They have a bitter taste. |
| They change the color of litmus paper to be red due to the presence of hydrogen ions ($H^+$) | They change the color of litmus paper to be blue due to the presence of hydroxide ions ($OH^-$). |
| Ex: $H_2SO_4$ - HCl | Ex: NaOH - $Ca(OH)_2$ |





الاكاسيد : مركبات تنتج من اتحاد العنصر(فلز – لافلز) مع الاكسجين

## 3 - Oxides

**Oxides**

*They are compounds resulted from the combination between oxygen and an element even through it is metal or non-metal.*

### Oxides are divided into

| Metal oxides | Non-metal oxides |
|---|---|
| *They are formed from the combination of oxygen with metal*<br><br>*Examples:*<br>*Sodium oxide $Na_2O$*<br>*Calcium oxide $CaO$*<br>*Aluminum oxide $Al_2O_3$* | *They are formed from the combination of oxygen with non-metal*<br><br>*Examples:*<br>*Carbon dioxide $CO_2$*<br>*Sculpture trioxide $SO_3$* |

## 4 - Salts

الاملاح : مركبات تنتج من اتحاد ايون موجب (مجموعة ذرية موجبة)مع مجموعة ذرية سالبة (لافلز ماعدا الاكسجين)

**Salts :**

*They are compound resulted from the combination of a positive ion (or positive atomic group) with a negative atomic group (or a negative nonmetal ion except oxygen).*

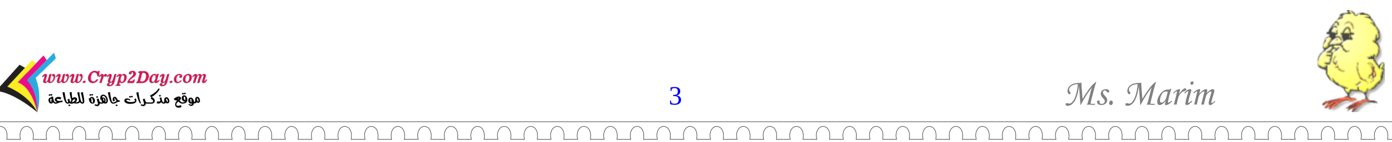
### Salts are produced from the combination of

| *Positive ion with negative ion* | *Positive ion with negative atomic group* | *Positive atomic group with negative ion* | *Positive atomic group with negative atomic group* |
|---|---|---|---|
| *Sodium chloride ($NaCl$)*<br>*Lead bromide ($PbBr_2$)* | *Sodium nitrate ($NaNO_3$)*<br>*Magnesium carbonate ($MgCO_3$* | *Ammonium chloride ($NH_4Cl$)*<br>*Ammonium bromide ($NH_4Br$)* | *Ammonium carbonate ($NH_4CO_3$ )* |

الاملاح نوعان – نوع يذوب فى الماء – الاخر لايذوب

### Some mineral salts are classified into

| Salts Soluble in water | Salts Insoluble in water |
|---|---|
| *Example:*<br>*Sodium chloride NaCL*<br>*Potassium sulphate K2SO4*<br>*Sodium sulphide $Na_2S$*<br>*Magnesium carbonate $MgCO_3$* | *Example:*<br>*Silver chloride $AgCl$*<br>*Lead iodide $PbI_2$*<br>*Lead sulphate $PbSO_4$* |




# Chemical equation & Chemical reaction

التفاعل الكيميائى

## What's meant by chemical reaction?

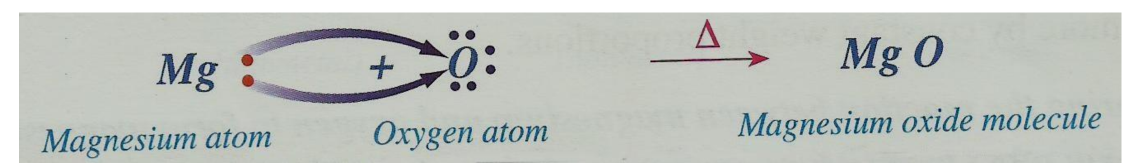
| Steps | Observation | Conclusion |
|---|---|---|
| Burn magnesium ribbon in the air. | magnesium ribbon changes into a white powder of a new substance. | Magnesium reacts with atmospheric oxygen (reactants) متفاعلات to from a new substance which is magnesium oxide (product) نواتج. $2Mg + O_2 \longrightarrow 2MgO$ Reactants products |

عند حرق الماغنسيوم فى الاكسجين الحرارة تكسر الرابطة التساهمية بين جزئ الاكسجين لتعطى ذرتين اكسجين نشط



## Explanation of Reaction:

1-Heat energy has broken the double covalent bond in oxygen molecule ($O_2$) to give two active oxygen atoms.




تتحد ذرة الاكسجين مع ذرة ماغنسيوم لتكون اكسيد الماغنسيوم ب رابطة ايونية جديدة

2-Oxygen atom joins with magnesium atom to from a molecule of manganese oxide by an ionic bond.

التفاعل الكيميائى : عملية كسر روابط المتفاعلات وتكوين روابط جديدة فى النواتج

**Chemical reaction**

It is a process that involves breaking the existing bonds in the reactant molecules and forms new bonds in the products.

## Chemical Equation

التفاعل الكيميائى نستطيع التعبير عنه ب المعادلة الكيميائية (متفاعلات – ظروف التفاعل - حرارة – نواتج)

A Chemical reaction can be represented by "Chemical Equation"

Reactants $\xrightarrow{\text{reaction conditions}}$ products3

المعادلة الكيميائية : مجموعة رموز وصيغ كيميائية تعبر عن المتفاعلات والنواتج وظروف التفاعل (حرارة – مركز – مخفف)

**Chemical Equation**

It is a set of symbols and chemical formule representing the reactants and products molecules in the chemical reaction and it represents the conditions of the reaction if they exist.



المعادلة الكيميائية يجب ان تكون متزنة (عدد ذرات المتفاعلات = عدد ذرات النواتج

**The chemical equation must be balanced** such that the number of atoms entering a reaction equals the number of atoms resulting from this reaction.

## Examples of chemical equations:

$2Mg + O_2 \xrightarrow{heat} 2MgO$

$C + O_2 \xrightarrow{heat} CO_2$

قانون النسب الثابتة : مجموع كتلة المتفاعلات = مجموع كتلة النواتج



## *Law of constant ratios*

*Activity 2 to verify the law of constant ratios:*

*Given that the atomic mass of Mg = 24 and that of oxygen = 16, we can calculate the total mass of reactants and products in the following equation.*

$2Mg + O_2 \longrightarrow 2MgO$

$(2 \times 24) + (2 \times 16) = 2\,(24+16)$

$48 + 32 = 2 \times 40$

$80 = 80$

*Observation*

*Each 48 g of magnesium joins with 32 g of oxygen to form 80 g of magnesium oxide.*

**i.e. the mass of the reactants = the mass of the products = 80 gm.**

المركب الناتج من اتحاد ذرة عنصرين بنسب وزنية ثابتة

*Conclusion:*

*A compound is produced from a chemical combination of atom of two elements or more by constant weight proportions.*

قانون النسب الثابتة : مجموع كتل المتفاعلات = مجموع كتل النواتج

*So, we can conclude the law of constant ratios as follows:*

| *Law of constant ratios* |
|---|
| *The total amount of reactants masses is equal to the total amount of products masses.* |

المعادلة الكيميائية يجب ان تكون متزنة – لان مجموع كتل المتفاعلات = مجموع كتل النواتج



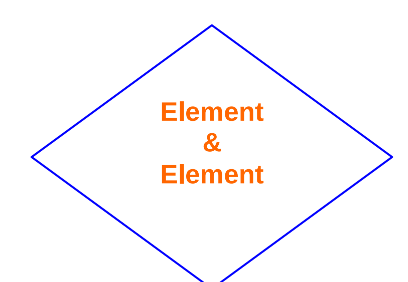
**G.R. the chemical equation should be balanced?**

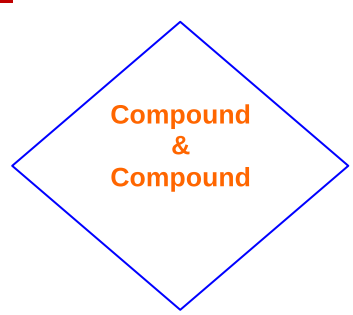
*Because the total mass of the reactants before the reaction must be equal to the total mass of the products after the reaction.*

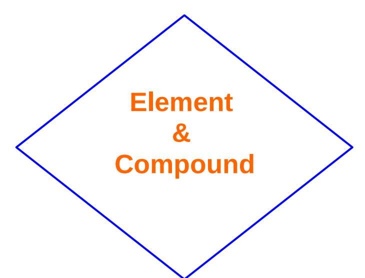
التفاعلات الكيميائية تفاعلات الاتحاد المباشر( عنصر+عنصر – مركب+مركب-عنصر+مركب ) انواع

# Types of chemical reactions

## Direct combination reactions تفاعلات الاتحاد المباشر






### A : combination of element and another element.

#### 1 - Combination between two non metals

C + $O_2$ ⟶ $CO_2$
Non metal, non metal, carbon dioxide

S + $O_2$ ⟶ $SO_2$
Non metal, non metal, sulphur dioxide

$H_2$ + $Cl_2$ ⟶ 2 HCl
Non metal, non metal, hydrogen chloride

#### Combination between metal and non metal

Mg + $O_2$ ⟶ 2MgO
Metal, non metal, magnesium oxide

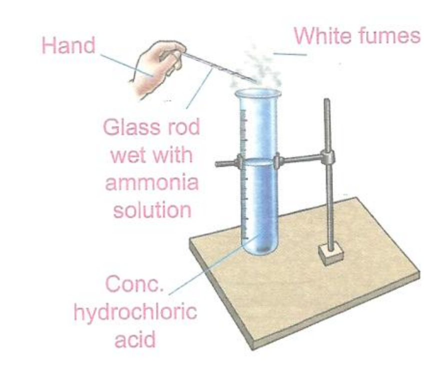
2Na + $Cl_2$ ⟶ 2NaCl
Metal, non metal, sodium chloride



### B. combination of compound and a compound

***Example : combination of ammonia gas and hydrochloric acid.***

$NH_3$ + HCl ⟶ (Conc.) $NH_4Cl$
**Compound**, **Compound**, **Ammonium chloride (white fumes)**










## C : combination of element with compound

### Example 1

*Reaction of oxygen with carbon monoxide (CO) producing carbon dioxide*

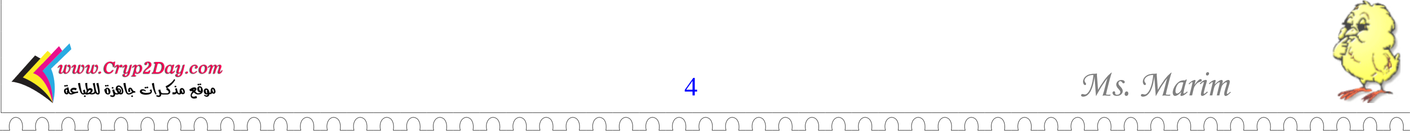
$2\ CO \quad + \quad O_2 \quad \rightarrow \quad 2\ CO_2$

**Compound** **element**

### Example 2

*Reaction of nitrogen monoxide and oxygen producing nitrogen dioxide*

$2\ NO \quad + \quad O_2 \quad \rightarrow \quad 2\ NO_2$





التفاعلات الكيميائية فى حياتنا اهميتها واضرارها

# Chemical reaction in our life

*Some chemical reactions play a vital role in our life and others have negative impacts (effects) on both human beings and environment.*

اهميتها : فى صناعة الادوية – السماد الزراعى – الوقود – البلاستيك

## A Useful applications of chemical reactions

*Through chemical reactions, thousands of compounds are commonly used in many industries such as medicines, fertilizers, fuel, plastics and others.*

اضرار التفاعلات الكيميائية ع الانسان والبيئة

## B Negative effects of chemical reactions on human beings and environment:

احتراق الوقود : يلوث البيئة لانه ينتج اول و ثانى اكسيد الكربون يرفع حرارة الارض

### 1 - Fuel burning



*It is an example of environment pollution due to the presence of harmful gases such as carbon oxides {carbon dioxide (CO2) and carbon monoxide (CO) which increase the air temperature, where:*

لانه يسمح بمرور اشعة الشمس ويمنع رجوعها (البيت الزجاجى للنبات)

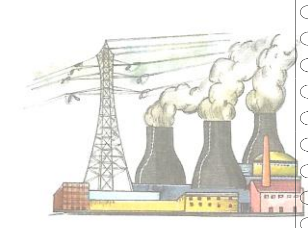
G.R Carbon dioxide ($CO_2$) acts as a greenhouse Bec. It permits the penetration of rays from the sun to the earth and never let them return back.

اول اكسيد الكربون خطير لانه يسبب صداع – دوخه – تعب – الم شديد بالمعدة – يؤدى للموت

*Carbon monoxide (CO) has a dangerous impact on the human being which it causes: Headache . Dizziness , Faint in addition to severe stomach aches and may lead to death.*

اكاسيد الكبريت (ثانى وثالث اكسيد الكبريت) غازات حمضية تسبب اغماء (صعوبة التنفس) – تآكل المبانى

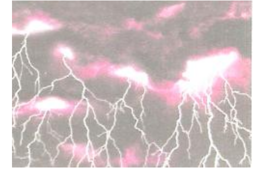
### 2 - Sulphur Oxides ( $SO_2$ , $SO_3$ )



*They are acidic gases causing:*
*Respiratory system malfunction (breathing problems).and Building corrosion.*

اكاسيد النيتروجين (اول وثانى اكسيد النيتروجين) اكاسيد حمضية تنتج من البرق
وهى غازات سامة تؤثر ع الجهاز العصبى والعين

### 3 - Nitrogen Oxides ( NO , $NO_2$ )



*They are acidic gases that are resulted at the time of lighting.*
*They are poisonous and that affect the nervous system and the eye.*

احتراق الفحم والياف السيليلوز (الورق والخشب والسجائر) يسبب تلوث الهواء – سرطان الرئة

### 4 - Burning of coal and cellulose fibers

*Such as burning paper and cigarettes cause air pollution and lung cancer.*




القوى الاساسية فى الطبيعة

# Universal force in Nature

## The force

### Activity 1) to understand the concept force: لفهم معنى القوة

| Activity | Explaining Figure | Observation and Conclusion |
|---|---|---|
| Try to push a wall by your hands.<br>حاول دفع الجدار – لايتحرك لان القوة غير مناسبة | | The wall doesn't move because the force acting on the object is improper. |
| Why do these objects remain static?<br>Because there is no force acting on them.<br>يبقى الجسم ساكن لانه لا يوجد قوة تؤثر عليه<br>Lift the book by your hand<br>حاول رفع الكتاب | | The objects move because the force acting on them is proper.<br>يتحرك لان القوة المؤثرة عليه مناسبة |
| Watch what happens for the moving ball when the goal keeper catches it<br>ماذا يحدث للكرة المتحركة عندما يمسكها الحارس<br>تتوقف لان القوة تستطيع ايقافها | | The moving ball stops its motion because the force acting on an object can stop its motion. |
| What happens when a racket hits the tennis ball<br>ماذا يحدث عندم يضرب المضرب الكرة<br>تغير الكرة الاتجاه لان القوة تغير اتجاه الجسم | | The ball changes its direction because the force acting on an object and change its direction. |

الاستنتاج : الجسم يتحرك عندما تؤثر عليه قوة مناسبة تغير من حالته (الثبات الى الحركة والعكس) او تغير اتجاه الحركة
القوة : مؤثر يحاول تغيير حالة الجسم من الثبات الى الحركة او العكس – او تغيير اتجاه الحركة

### General conclusion:

The objects move when a proper force acts on them to change the state of the object from static state to motion or vice versa or to change the motion direction.

**Force**

It is an effect attempts to change the object's phase from being static to motion or vice versa or attempts to change the motion direction.

وحدة قياس القوة هى النيوتن

The measuring unit of the force is Newton

G.R. The static car doesn't move when you try to move it?
Because the force acting on it is improper to move it.






Ms. Marim



# Universal force in Nature

هناك انواع مختلفة من القوى لا نراها ولكن نحس بها مثل البرق – الرعد – الرياح – الجاذبية – المفاعل الذرى – المغناطيس – الاسلحة النارية(البندقية) -الكهرباء – المفاعل النووى

*There are many different types of forces, these forces cannot be seen but we can feel them in some phenomena such as:*

- Lightning - Thunder
- The attraction of objects to Earth
- The attraction of iron to magnet.
- Generating the electric current.
- Wind motion
- Atomic reactors.
- Fire weapons.
- Nuclear explosions

تنقسم القوى الى : قوى التجاذب – قوى كهربية مغناطيسية – قوى نووية

All these phenomena are belonging to force which can be Divided into

**First**: Attraction forces

**Second**: Electromagnetic forces

**Third**: Nuclear forces

1) Weak nuclear forces

2) Strong nuclear

قوى التجاذب : هى قوة الجاذبية بين الاجسام فى الكون

## First: Attraction forces

- There is an attraction force (gravitational force) between any two masses in the universe.

العالم نيوتن اكتشف الجاذبية عند وقوع تفاحة من الشجرة

## 1)Earth's gravity force to objects

- **Newton was the first one who discovered the Earth's gravity force when he was standing under a tree and found an apple falling down to the ground.**

*Activity 2) >>> to know the factors affecting the Earth's gravitational force:*

العوامل التى تؤثر ع قوة الجاذبية (الوزن) هى كتلة الجسم وعجلة الجاذبية الارضية (مقدار قوة الجاذبية = 10 او 9و8م/ث$^2$

| Step | Observation | Conclusion |
|---|---|---|
| Put on the ground a mass (1 kg - 5 kg - 10 kg)<br>- Try to lift the masses and put them on a table<br>ارفع كتل مختلفة ع منضدة | The work done to lift objects, increases by increasing the objects mass.<br>الشغل اللازم لرفع الكتل يزيد بزيادة كمية الكتلة | Earth attracts the objects to its center by a force called "object's weight ".<br>قوة الجاذبية (الوزن) تعتمد ع الكتلة – عجلة الجاذبية الارضية<br>This force (object's weight) depends on: - object's mass. - Earth's gravity acceleration. |

ارفع كتل مختلفة ع منضدة








وزن الجسم : قدرة الارض ع جذب الاجسام لمركزها

**Object's weight**

*It is the ability of the Earth to attract that object to its center.*

مركز جذب الجسم : نقطة فى منتصف الجسم تتأثر بالجاذبية

**Object's center of gravity**

*It is the point at the center of the object at which the force of gravity affects the object.*

العوامل التى تؤثر وزن الجسم 1- تزداد كتلة الجسم يزداد وزن الجسم (علاقة طردية)

2- عجلة الجاذبية : عند الاقتراب من مركز الارض تزداد عجلة الجاذبية والعكس صحيح



## The factors affecting the Earth's gravitational force = Weight

## Object's mass:

- *As the object's mass increase the object's weight increase.*
- *So object's weight is **directly proportional** (relation) to the object's mass.*

---

## Earth's gravity acceleration:

- *As we approach more to the Earth's center, the value of Earth's gravity acceleration increase and vice versa*

- **G.R Object's weight changes from a place to another on the Earth's surface**

  Earth gravity acceleration changes from place to another

**G.R Earth gravity acceleration changes from place to another**

Due to non spherical shape of the Earth (change distances from Earth center)

*So, the weight of an object can be calculated using the following relation:*

يمكن حساب وزن الجسم من العلاقة

Object's weight (W) = Object's mass (M) × Earth's gravity acceleration

Newton　　　　Kg　　　　$9.8 = 10\ m/s^2$



**Example:**

*Find the weight of a bag of 1 kg. Mass knowing that the acceleration due to gravity is $10\ m/s^2$.*

**Answer**

*Weight = mass × Earth's gravity acceleration = 1 × 10 = 10 Newton*







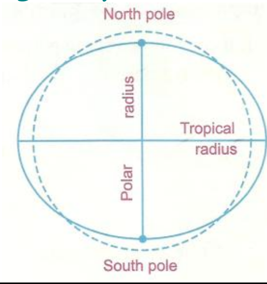

## Notice

** objects weight changes from place to another due to change of earth gravity acceleration (g) because of the non-spherical shape of earth.

تقل الجاذبية كلما بعدنا عن مركز الارض – لذلك الجاذبية اقل عند خط الاستواء عن القطبين

** Gravity decrease with altitude (height) as the distance from earth center increase.

** Gravity is less strong at the equator than at the poles.




## Second: Electromagnetic forces

القوى الكهرومغناطيسية : قوة المغناطيسية الناتجة عن مرور تيار كهربى فى ملف

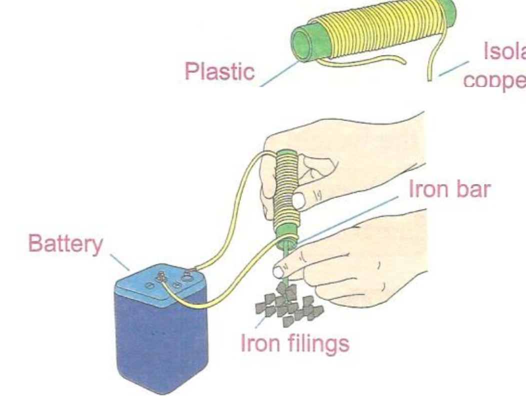
It is the magnetic force (magnetism) produced by the effect of passing the electric current (the flow of electric charges) through a coil.

فكرة عمل المغناطيس الكهربى



### Activity 4 To show the magnetic forces of electric current.

The idea of show the electromagnet work.




**Materials:**

A long isolated copper wire.
A wrought iron bar (or nail).
A dry battery
Plastic tube.
Iron fillings.

| steps | Observation | Conclusion |
|---|---|---|
| Connect the two ends of the wire to the battery.<br>Approach the iron core (inside the tube) to the iron fillings. | The iron bar attracts the iron fillings (as it changes into a magnet).<br>المسمار يجذب برادة الحديد | Electric current has a magnetic effect.<br>التيار الكهربى له تأثير مغناطيسى |

## Applications on electromagnetic forces

المغناطيس الكهربى : يتركب من سلك ملفوف حول مسمار حديد (مطاوع)

### 1 - Electromagnet:

Its structure: It is made up of an isolated copper wire coiling around a bar of wrought iron.

فكرة عمل المغناطيس الكهربى : عند مرور التيار فى ملف من السلك يصبح مغناطيس



### The idea of how it works:

When the electric current passes through a coil, it works as a magnet.
(It changes the electric energy into magnetic energy).





يستخدم المغناطيس الكهربى فى عدة اجهزة : الونش لرفع كتل حديد او سيارات – الجرس الكهربى

*Uses of electromagnet* **.** *It is used in many sets such as:*

*** Electric winches which lift scrap iron and cars in ports.*

*** Electric bells.*

المولد الكهربى (الدينامو) : يستخدم لتحويل الطاقة الميكانيكية (الحركية) الى كهربية



## 2 - Electric generators

*They are used in converting the mechanical energy into electric energy such as "the dynamo".*

الموتور الكهربى : يستخدم فى تحويل الطاقة الكهربية الى ميكانيكية ( المروحة – الخلاط – الغسالة)

## 3 - Electric Motor

*They are used in converting the electric energy into mechanical energy such as the motor in the fan, the blinder and washing machines.*

القوى النووية : اكتشف العلماء ان الذرة تخزن قوى هائلة داخل النواة – نجحوا فى الحصول عليها واستخدامها فى الاغراض العسكرية والسلمية



## Third: Nuclear forces

*Scientists have discovered that an atom stores a massive amount of energy inside its nucleus.*

*They succeeded in getting this nuclear energy out and using it in:*

*The military purposes. * Peaceful purposes.

تنقسم القوى النووية الى ضعيفة و قوية



***This massive energy is accompanied with forces know as Nuclear forces which can be divided into weak and strong nuclear forces.***

القوى النووية الضعيفة تستخدم للحصول ع العناصر المشعة والاشعات فى الطب – الابحاث العلمية - الصناعة

## Weak nuclear forces

*They are used to get radiant elements and radiations which are used in:*

Medicine.

Scientific researches.

Industry.

قوى نووية قوية تعطى طاقة نووية تستخدم فى انتاج الكهرباء – الاغراض العسكرية

## Strong nuclear forces

*These nuclear forces liberate nuclear energy which is used in:*

producing electric energy.

military proposes.

تسعى مصر لاستخدام الطاقة النووية فى انتاج الكهرباء

***Egypt** seeks to use **nuclear energy** in producing **electricity** than the other forms of energy.*





# Accompanied forces to Motion

القوى المصاحبة للحركة (قوة القصور الذاتى – قوة الاحتكاك)

*The accompanied forces produced due to the motion are:*

1 – Force of inertia　　　　　2 – Friction force.

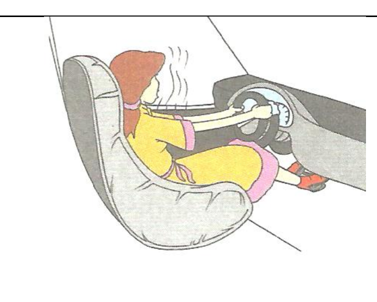
قوة القصور الذاتى : عند تأثير قوة ع جسم – الجسم يقاوم التغيير فى الحركة نتيجة للقصور الذاتى

## First: Force of inertia

***When forces act on objects which were at rest or moving with a constant speed. These objects resist changes in their motion because of their Inertia.***

امثلة لتفسير القصور الذاتى

## Examples: Indicating inertia in our life:

| | |
|---|---|
| Ex: passengers and deriver in moving bus are rushed forward when bus stops suddenly.<br>يندفع الركاب فى السيارة للامام عند التوقف فجأة – لان الراكب يحاول الحفاظ ع حالة الحركة (او مقاومة التغيير فى الحركة)<br>Interpretation: التفسير<br>When car or bus stops suddenly, passengers and driver try to maintain their state of motion, so they rush forward. | |
| Ex: passengers and deriver in a static bus are rushed back once vehicle starts moving forward after it was at rest.<br>يندفع الركاب للخلف عند بدء حركة السيارة – لان الراكب يحاول الحفاظ ع حالة الثبات<br>Interpretation:<br>When car or bus moves forward suddenly, passengers and driver try to maintain their state or rest, so they force back. |  |
| Ex: a football player rushes forward and falls on ground if he is tripped during running.<br>اندفاع لاعب الكرة للامام عند تعثره اثناء الجرى – لانه يحاول الحفاظ ع حالة الحركة<br>Interpretation:<br>When football player is running, he tries to maintain his state of motion forward so, if he is tripped, he will be forced forward and falls down. |  |

جميع الامثلة السابقة نتيجة القصور الذاتى

The force in the previous examples is called INERTIA

القصور الذاتى : خاصية الجسم يقاوم التغير فى الحركة اذا اثرت عليه قوة خارجية (توقف السيارة او تحركها فجأة)

## INERTIA

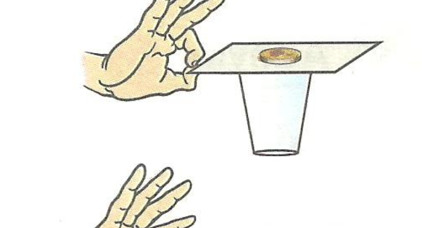
It is a property of an object has to resist the change of its phase from rest to motion with a regular speed in a straight line unless an external force acted on it.

## Activity >>> to show that objects resist change of rest state:

وقوع العملة فى الكوب يعبر ان قوة القصور الذاتى تجعل الجسم يقاوم التغير فى حالة الثبات

### Procedures :

*- place a piece of paper on the top of a glass cup and put a coin on it.*
*- use your forefinger to deliver a quick hit to the paper.*



### Observation:

*The paper will go away from the cup, while the coin falls inside the cup.*

### Conclusion:

*Force of inertia makes object resist the change of its rest state.*

تطبيقات ع استخدام القصور الذاتى : حزام الامان فى السيارة – لانه يوقف قوة القصور الذاتى (الاندفاع) لحماية الركاب

## Technological application on force of inertia

Using the **safety belts** in cars and planes which work to **stop the forces of inertia** to protect passengers form injured when a sudden change in motion occurs.

قوة الاحتكاك : عند حركة الجسم فى الهواء او الماء فإنه يواجه قوة تقاوم وتقلل حركته

## Second: Friction

When an object moves through air or water, it faces resistance force which tries to decrease its motion.

عند دفع قطعة من الثلج واستيكة ع منضدة فإن الثلج يتحرك اسرع – الاستيكة تتحرك ببطء نتيجة قوة الاحتكاك

## Example: place an ice cube and rubber on a table:

*Give each one little push, …….. what happens?*

** the ice cube will move easily, but the rubber will be difficult to push.
>>> there is a force that prevents it from moving.

This force is called Friction and can be defined as follows:



قوة الاحتكاك : القوة المقاومة للحركة (ضد الحركة) تنشأ بين الجسم المتحرك والوسط الملامس له (الارض – الهواء)

## Friction forces:

They are resistant forces (against motion) originate between the object in motion and the medium touching it.

### Activity >>> to show friction brakes:

عند الضغط ع الفرامل تتوقف العجلة – نتيجة قوة الاحتكاك بين العجلة والارض تقاوم الحركة

**Procedure:**

*Ride a bike and use the brakes, observe what happens!!*

**Observation:**

*The bike stops moving in a short time.*

**Conclusion:**

*Friction between the object in motion with the ground, air or a surrounding medium generated a force (friction force) against the motion to resist it.*

فائدة قوة الاحتكاك : تمنع التزحلق – تساعد فى توقف السيارة (الفرامل) – تساعد فى بداية حركة السيارة نتيجة الاحتكاك بين الاطارات والارض – تساعد فى احتراق الكبريت

### Benefits of friction

1 - It prevents feet form slipping on roads during walking.

2 - It helps in stopping cars motion. When we use brakes.

3 - It helps in starting car motion due friction between cars tires and ground.

4 - It helps in burning of match.

اضرار الاحتكاك : فقد فى الطاقة الحركية لتحولها الى حرارية – تنتج طاقة حرارية تؤثر ع كفاءة الالات – تسبب تآكل الالات

### Harms of friction

1 - It causes a great loss of mechanical energy because this energy is changed into heat energy.

2 - It produces heat energy between parts of machines, which affects their performance.

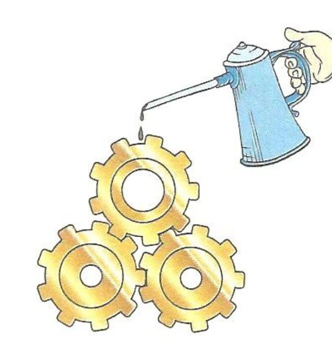
3 - It causes the erosion of machines parts and damages them as well.









لتقليل قوة الاحتكاك : تشحيم وتزييت الالات لتقليل الاحتكاك وعدم التآكل والحفاظ ع استهلاك الوقود

## How to limit the friction force?

*Lubricating and oiling mechanical machines. To reduce the friction between moving parts of machines and prevent their erosion, and reduce the waste of fuel.*

تغطى اطارات السيارة بمادة خشنة : لزيادة قوة الاحتكاك بين الاطار والارض يساعد فى حركة السيارة او التوقف

*Car tires are covered with a very coarse substance?*

*To increase friction between tires and the road to help car in starting motion and stopping.*

القوى داخل جسم الانسان تساعده ع القيام بكل العمليات الحيوية للحياة

## Forces inside living systems

*- There are forces inside living systems whether:*

*These forces enable a living organism to do its biological operations and keep its survival and vitality.* -

امثلة للقوى داخل الجسم التى تساعد فى :

١ - انقباض وانبساط عضلات القلب تساعد فى ضخ الدم الى اعضاء الاجسم

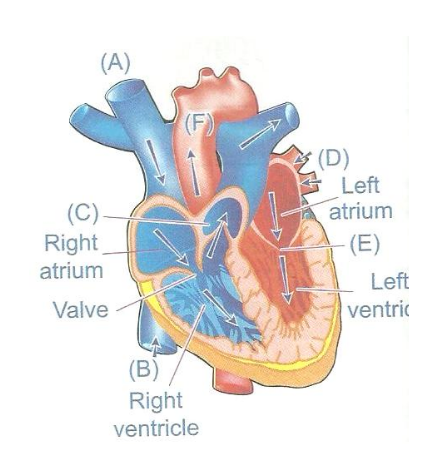
٢ - النبض داخل الاوعية الدموية يساعد الدم فى الوصول للقلب ضد الجاذبية

٣ - انتقال السوائل والاملاح من التربة (تركيز ملحى منخفض) الى اجزاء النبات (تركيز اعلى)

٤ - انقباض وانبساط العضلات يساعد الجسم فى الحركة

٥ - اندفاع المياه الجوفية لرى النبات عن طريق مضخة المياه

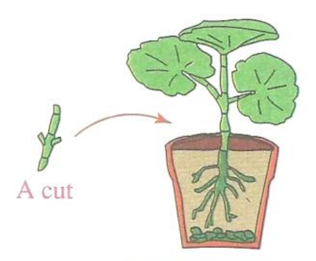
## Examples>>> of force inside living systems:




1 - Heart muscle contraction and relaxation helps the heart pump the blood all over the body organs.

2 -pulse inside blood vessels >> help blood rise to the heart from the lower parts against gravity.

3 - Liquids transport through pores and the walls of cells from lower concentration to higher one >>>> that help water and salts go up from the soil to plant.




Reproduction by cutting

4 - The contraction and relaxation of muscles >>> help the body organs movement.

*** pumping water upwards form canals and from under ground water by using water pump to irrigate plants.



# Motion

You have learned in the previous lessons that force affects on objects causing their motion.

الحركة : هى تغير مكان الجسم بمرور الوقت

**Motion:**
it is the change in position in space with time passes.

اذا كانت حركة جسم مرتبطة بجسم اخر او مكان محدد فإنها تسمى حركة نسبية

If this motion is estimated relative to another object or a fixed point, so it is called relative motion.

مفهوم الحركة النسبية (تطبيقات – امثلة فى الحياة)

## First: Relative motion concept

### Applications on relative motion in your life:

| Application | Explaining Figures | Observation |
|---|---|---|
| If you are in a moving car and another car moves beside you in the same direction with the same speed.<br>عند تحرك سيارتين فى نفس الاتجاه بنفس السرعة – تلاحظ ان السيارتين لا يتحركا بالنسبة (للركاب داخل السيارة) | | You will imagine that the two cars stop moving and no motion will be observed. |
| * If your car moves beside a stopping car.<br>Or<br>• Your car moves in higher speed and passes the other car.<br>تمر سيارة جنب اخرى ثابتة – اسرع منها – تلاحظ ان السيارة الثابتة تسير للخلف | | You will imagine that the other car goes backward. |
| If you are in a stopping car and another car moves forward beside you.<br>عند وجودك فى سيارة ثابتة – تلاحظ ان سيارتك ترجع للخلف بالنسبة للسيارات المتحركة | | You will imagine that your car moves backward. |
| If your car moves in opposite direction to another car moves in low speed.<br>عند تحرك سيارتك فى وضع عكسى للسيارات<br>تلاحظ ان السيارات تسير بسرعة كبيرة | | You will imagine that the other car moves with a high speed. |





الحركة النسبية : هو تغيير فى وضع او اتجاه جسم بمرور الوقت بالنسبة لجسم اخر او نقطة ثابتة تسمى نقطة مرجعية

From the previous application, we can define the relative motion as follows:

**Relative motion**

*It is the change in an abject position or direction as the time passes relative (proportion) to another object or fixed point known as frame of reference.*

انواع الحركة : حركة انتقالية(من مكان لاخر) – حركة دورية(تتكرر ب انتظام)

## Second: types of motion

The motion of objects is divided into two types

A. translation motion

B. periodic motion

الحركة الانتقالية : هى تغير مكان الجسم بالنسبة لنقطة ثابتة من وقت لاخر – لها بداية ونهاية للحركة
مثل حركة الانسان – السيارة - القطار

### A. translation motion

**Translational motion:**

*It is the motion in which the object's position is changed relative to a fixed point (or a fixed frame of reference) from time to time between* **initial and final positions**.

Example: of translational motion:

A person motion - A car motion -A train motion

**G.R. translational motion is considered as a relative motion?**

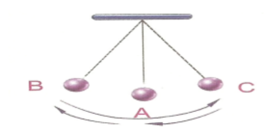
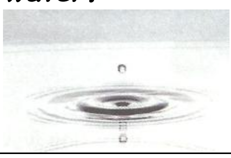
Because it is a change of an object's position as time passes relative to another object.

### B: Periodic motion

الحركة الدورية : هى الحركة التى تتكرر بانتظام على فترات متساوية – مثل بندول الساعة – المروحة- حركة امواج الماء

**Periodic motion** It is a motion which is regularly repeated in equal periods of time.

**Example: of periodic motion:**

| 1 -Vibrating motion اهتزازية | 2 -Circular motion دائرية | 3 -Wave motion موجية |
|---|---|---|
| *As the motion of the simple pendulum.*   | *As the motion of one of the fan arms while it is on.*  | *As the motion produced after throwing a stone* رمى حجر *in water.*  |

## Comparison between translational motion and periodic motion:

| Translational motion | Periodic motion |
|---|---|
| It is a motion which is changed from time to time relative to a fixed point.<br><br>It has initial and final positions. | It is a motion which is regularly in equal periods of time.<br><br>It doesn't have initial or final positions. |

سندرس الحركة الموجية : التى تنقسم الى موجات ميكانيكية – موجات كهربية مغناطيسية

## *Third: Wave motion*

*The wave causing wave moiton are divided into two types*

*A : Mechanical waves*

*B : Electromagnetic waves*

الموجات الميكانيكية مثل موجات الصوت والماء – تحدث نتيجة اهتزاز الاجسام – السرعة صغيرة- تحتاج وسط للانتقال داخله مثل (الهواء-الماء-الاجسام الصلبة) – اى لا تسير فى الفضاء

### *A : Mechanical waves*

**They are waves characterized by:**

1 - They are produced due to the vibration of the medium particles.
2 - Their speed is relatively low (speed of sound is about 340 m/s)
3 - They need a medium to transfer through (such as air, liquids, solids …)
*i.e. (They don't travel through space).*

**Examples:** Sound waves. Water waves.

الموجات الكهرومغناطيسية: مصاحبة للمجال الكهربى والمغناطيسى – السرعة عالية – لا تحتاج لوسط (تسير فى الفضاء)

### *B : Electromagnetic waves*

**They are waves characterized by:**

1 - They are accompanied with electric and magnetic fields.
2 - Their speed is extremely high (speed of light is about 300 million m/s).
3 - They don't need a medium to travel (they can travel through space).
*i.e. (They can spread in all media and space).*

Examples:

Light waves - Radio and television waves.
Ultraviolet and infrared rays (accompanied to sun rays). مصاحبة لاشعة الشمس
X-rays - Gamma rays - Wireless waves. (Which are used in communications). فى الاتصالات






Ms. Marim



نستقبل ضوء الشمس ولا نسمع انفجارات الشمس – لان الضوء موجات كهرومغناطيسية تنتقل فى الفضاء – الصوت موجات ميكانيكية لا تنتقل فى الفضاء

**G.R We receive the sunlight at the same time we don't hear the sound of solar explosions?**
Because light is electromagnetic waves which don't need a medium to travel, while sound is mechanical waves which need a medium to travel through .

نرى البرق قبل الرعد بالرغم من حدوث فى نفس الوقت – لان سرعة الضوء (كهرومغناطيسية) اكبر من سرعة الصوت (ميكانيكية)

**G.R We see lightning before hearing thunder although they occur at the same time?**
Because the speed of light is much greater than the speed of sound.

## Comparison between mechanical waves and electromagnetic waves:

| Mechanical waves | Electromagnetic waves |
|---|---|
| 1. They are produced by the vibration of the medium particles. | 1. They are accompanied by electric and magnetic fields. |
| 2. They need a medium to transfer through. | 2. They spread in all media and space. |
| 3. Their speed is relatively low (speed of sound is about 340 m/s). | 3. Their speed is very high (speed of light is about 300 million m/s). |
| Examples: Sound waves - Water waves. | Examples: Light waves. X-rays. Radio waves. |

تطبيقات تكنولوجية ع الموجات الميكانيكية (موجات الصوت)

## *Technological applications of waves*

### A) Some technological applications of mechanical waves:

- Sound waves *(as an example of mechanical waves) are used in*:

تستخدم الموجات الصوتية : اجهزة فحص وعلاج المرضى - السونار

1. Examining and curing sets for the human body using sound waves

*(Ultrasonic waves or sonar).*




2. Musical instruments: الالات الموسيقية الوترية مثل الجيتار

*a. Stringed musical instruments as:*
*Violin, lute and guitar.*

الات النفخ الهوائية مثل المزمار

*B -Pneumatic musical instruments such as:*
*Flute and read pipe.*

مكبرات الصوت واجهزة توزيع الموسيقى والتحكم فى الاصوات

3 – Amplifiers and sets of distributing and controlling sound used in studios.



## B. Some technological applications of electromagnetic waves:

| Rays | Applications – uses | Figure |
|---|---|---|
| Infrared (IR) rays | 1. In night vision apparatus used by modern military forces.<br>اجهزة الرؤية الليلية فى الاغراض العسكرية<br>2. Remote sensing instrument to photograph Earth's surface using satellites.<br>اجهزة التحكم للقمر الصناعى لتصوير الارض<br>3. In making food because these rays have heat effect property.<br>طهى الطعام (الميكرويف) لان لها تأثير حرارى<br>4. In making remote sets to control and start electric sets (TV, , air conditioner )<br>عمل اجهزة الريموت | Night vision apparatus<br>Microwave<br>Remotes |
| Ultraviolet (UV)rays: | They have the property of killing microbes so that they are used to sterilize the sets of surgical operations rooms.<br>تعقيم حجرة العمليات لانها تقتل الميكروبات | |
| X-rays: | -Photographing bones for detecting the bone fractures.<br>تصوير العظام المكسورة – كشف عيوب الصناعات<br>-Examining mineral rows in industry and showing errors pores and cracks in these minerals. | X-ray photos |
| Gamma rays: | In medical purposes as the treatment and discovering some swellings. | فى الطب فى علاج واكتشاف الاورام |
| Visible (seen) light: | In photographic cameras.<br>In television cameras.<br>In light shows (data show)<br>كاميرا التصوير – اجهزة العرض | Digital camera |

*N.B.* لاحظ

Ultraviolet rays, x-rays and gamma rays are used in **medical purposes**. فى الاغراض الطبية

Infrared rays and visible light are used in **photographing**. التصوير

## Fourth: Graphing motion:

الرسم البيانى للحركة

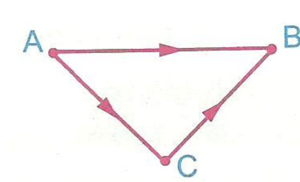
الاجسام توجد فى حالة ثبات او حالة الحركة

*Objects in nature are found in two states:*

*1 – Static objects (objects in state of rest).*

*2- Moving objects:*

فى الرسم الجسم يسير مسافة *CB +AC* ويسير ازاحة (مسافة لها اتجاه معين) AB




**When a car travels between two points (from A to) through (c)**

- *The distance traveled by the car = AC + CB*
- *The displacement of the car = length of (AB) in the direction of (AB)*

الازاحة : هى المسافة التى يقطعها الجسم بعيدا عن مكانه فى اى لحظة واتجاه محدد

**Displacement**

It is the distance which an object moves away from its original position at any moment in a certain direction.

***What's means by the displacement of an object is 40 meters?**

This means that the distance which this object moves away from its original position is 40 meters.

السرعة = الازاحة / الوقت

**Speed = displacement / time**

## Displacement / time graphs

السرعة المنتظمة : السيارة تتحرك مسافات متساوية فى الثانية – الغير منتظمة : يتحرك مسافات غير متساوية فى الثانية

### 1 - For moving objects:

*الجسم المتحرك*

***According to the speed by which the object moves, the state of object can be divided into:***

| A: Objects move with regular speed | B: objects move with irregular speed. |
|---|---|
| - The car moves equal distance every one second in certain direction.(straight line) | - The car moves unequal distances every one second in certain direction(curved line) |

| Displacement | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|
| Time (sec) | 1 | 2 | 3 | 4 | 5 |

| Displacement | 5 | 9 | 20 | 35 | 55 |
|---|---|---|---|---|---|
| Time (sec) | 1 | 2 | 3 | 4 | 5 |

Displacement (m)
60, 50, 40, 30, 20, 10
Straight line
0 1 2 3 4 5 Time (sec.)
(Point of origin)

Displacement (m)
60, 50, 40, 30, 20, 10
Curved line
0 1 2 3 4 5 Time (sec.)
(Point of origin)



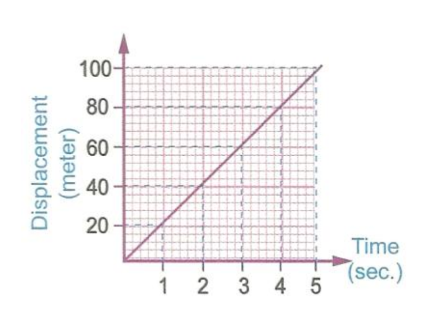


السرعة : هى الازاحة (المسافة) التى يقطعها الجسم فى الثانية

*The speed can be defined as follows:*

**The speed:**

*It is the displacement covered by an object in a unit time.*




*Example: in the opposite graph represents the motion of a body:*

*1 – Mention the kind of motion of this body? Why?*

*2 – Calculate the distance covered by this body after 3 seconds and 5 seconds?*

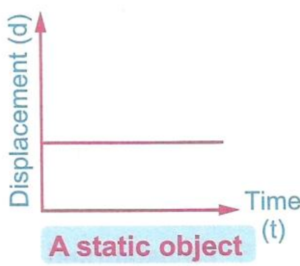
*Answer:*

*1 – It moves with regular speed.*
*Because the displacements covered by the body every second are equal.*

*2 – Distance after : 3 seconds is 60 meters.*
*5 seconds is 100 meters.*

2 - For static objects:

- الجسم فى حالة ثبات لا يتحرك

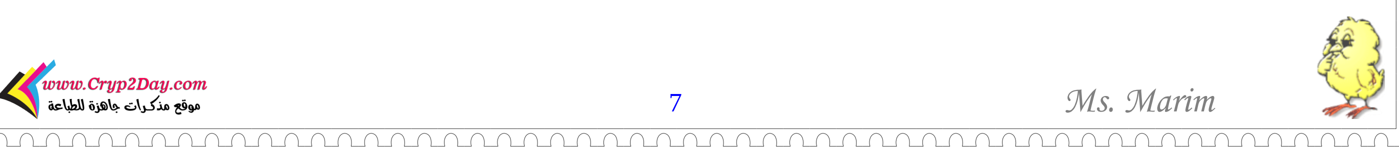



عندما تكون قيمة الازاحة ثابتة (لا تتغير بتغير الوقت)

*When the displacement value of an object is fixed (it doesn't change as time passes)*

يقال ان الجسم فى حالة ثبات ويمثل بخط مستقيم موازى لمحور الوقت

- *It is said that the object is static (or at rest).*
*It is represented by a straight line parallel to the axis of time.*





# Unit 3: Lesson 1: Celestial bodies

النجوم : اجسام كبيرة الحجم تشع كمية هائلة من الحرارة والضوء – عددها كبير – المسافات بينها كبيرة جدا لذلك لا تقاس بالكيلو متر ولكن تقاس ب السنة الضوئية

***Stars:**

They are big sized bodies emit enormous amounts of heat & light.
They are a huge number & the distance between them very large so we measure them by light year.

السنة الضوئية : هى المسافة التى يقطعها الضوء فى سنة

***Light year:**
It is the distance covered by light in one year. Light year = $9.467 \times 10^{24}$ km
Distance in light year = distance in kilometer / $9.467 \times 10$
Distance in kilometer = distance In light year × $9.467 \times 10$

المجرات : الوحدات العظمى للكون – تجمعات (ملايين) من النجوم

***Galaxies:**
They are grand (bigger) units forming universe.
OR They are tremendous collection of stars.
OR They are a system of thousands of millions of stars.

مجرة الطريق اللبنى : المجرة التى توجد بها المجموعة الشمسية لها اذرع حلزونية

***Milky way galaxy:**
Spiral arms extend from it when sun (solar system) lies on one spiral arm.

التلسكوبات تستخدم لاكتشاف الاجسام الفضائية – انواعها تلسكوب عاكس – كاسر

***Telescopes**: Used to discover celestial bodies
Two types: **(Reflection telescope & Refraction telescope).**

المجموعة الشمسية : تتكون من الشمس – الكواكب – الاقمار – اجسام فضائية (نيازك – شهب – مذنبات – كويكبات)

***Solar system:**
Consists of: 1)-Sun 2)-Plants 3)-Moons (natural satellites) 4)-Other celestial bodies.

الشمس : نجم – اكبر جسم – منتصف المجموعة الشمسية

**1-Sun**:
It is the star in solar system.
OR It is the biggest body in solar system.
OR It lies in the center of solar system& all bodies revolve around it.

الكواكب : 8 اجسام بيضاوية معتمة تدور حول الشمس – تنقسم الى كواكب داخلية – كواكب خارجية

**2- Planets:**
They are eight spherical opaque bodies revolve around sun in one direction.

| Inner planets | Outer planets |
|---|---|
| 1-They are nearest four planets to sun.<br>2-Mercury, Venus, Earth& Mars.<br>3-Small in size<br>4-Structure: rocky components. مكونات صخرية<br>5-High density. كثافة عالية | 1-They are farthest four planets from sun.<br>2-Jupiter, Saturn, Uranus& Neptune.<br>3-Big in size<br>4--Structure: Solidified gases. غازات صلبة<br>5-low density كثافة منخفضة |



| 6-Afew number of moons rotate around them earth (one moon)& mars (two) but mercury and Venus have no moons<br>7-They have small gravitational force. | 6-they have large number of moons.<br>7-they have large gravitational force<br>قوة جاذبية كبيرة |
|---|---|

- Smallest plant is: mercury -large planet is: Jupiter.
-Smallest planet in gravity: is Mars, but largest one in gravity: is Jupiter.
-Earth: is 6th in gravity, 3rd in distance from sun and 4th in volume (size).
Earth is the planet that we live on it and it is the highest density in the inner planets.

**G.R Hydrogen gas is present in a solid state on the surface of outer planets**

**Due to the high pressure and extreme coldness on the surfaces of these planets.**

**اسحاق نيوتن اثبت ان قوى التجاذب بين الاجسام فى الفضاء تعتمد ع الكتلة والمسافة**

**Isaac Newton proved that attraction force among objects in the space depends on**

1- The mass of each object.
2- The distance between them.

**الاقمار : كواكب صغيرة تتأثر بالجاذبية للكواكب وتدور حولها**

**3-Moons:**
They are small planets (satellites) affected by the gravity of larger planets & rotate around them.

**4-Other celestial bodies:**

**الكويكبات : اجسام صخرية تدور حول الشمس فى منطقة حزام الكويكبات (المنطقة بين الكواكب الداخلية والخارجية)**

**1-Asteriods:** **الكويكبات**
They are rocky bodies rotate around sun in region of belt of wanderer asteroids
*-**Belt of wanderer asteroids**: It is the region between the group of inner & outer planets.

**الشهب : سهام ضوئية فى السماء نتيجة احتراق كامل للكتل الصخرية نتيجة الاحتكاك بالغلاف الجوى**

**2-Meteors:الشهب**
They are luminous arrows that can be seen in sky due to completely burning of small rocky masses in earth'satmosphere.

**النيازك : الجزء المتبقى من الكتل الصخرية الكبيرة بعد احتراق جزء منها**

**3-Meteorites:النيازك**
They are the remaining part of rocky masses without burning that fall on earth’s surface.
Ex: Meteorite exists at southern west of Africa.



**المذنبات : كتل صخرية ثلجية وغازات صلبة تدور حول الشمس فى مدار بيضاوى كبير متقاطع مع مدار الكواكب**

**4-Comets: المذنبات**

They are masses of rocks, ice and solidified gases that revolve around sun in more elongated elliptical orbits intersecting with orbits of planets.

**يتكون من رأس : ثلج وغازات صلبة – اجزاء صخرية – غبار وماء – الذيل : سحابة غازية**

***-Consists of:**

**1-head**: Contains icy spheres that mixture of solidified gases (nitrogen, carbon dioxide& methane gases), rocky parts & Dust and water molecules.

**2-tail**: Gaseous cloud.

**المذنب هالى : اشهر مذنب يكمل دورانه حول الشمس مرة كل 76 عام يتقاطع مداره مع مدار الارض**

***-Halley comet:**

Is famous comet in which completes its revolution around sun each 76 years and its orbit is intersecting with earth's orbit.



# Lesson 2: The Earth

- الارض تدور حول الشمس تحت تأثير الجاذبية
- Earth revolves around sun by action gravity in 365.25 days.
- الارض رقم 3 فى البعد عن الشمس – تبعد 150 مليون كم
- Earth is third position from sun which distance between them 150 million kilometers.
- شكل الارض كروية مفلطحة عند القطبين – منبعجة عند خط الاستواء لذلك القطر الاستوائى اكبر من القطبى
- **Earths shape**

  is spherical object about to be completely circular accompanied with a slight flattening at two poles and indented outward at equator.

  So the tropical radius is about 22 km larger than polar radius.
- حجم الارض متوسط وترتيبها الرابع لانها اكبر الكواكب الداخلية
- **The Earth's volume**

  is medium between planets where it fourth order.bec. It is the biggest inner planet - and its average radius is about (6368 km).
- اكبر كتلة فى الكواكب الداخلية
- **The earth's mass**

  is biggest mass in inner planets it is mass about $5.9 \times 10^{24}$ Kg.
- خصائص الارض التى تدعم استمرار الحياة

***Characteristics of earth that support continuity of life:**

- وجود غلاف جوى (ابيض اللون) – يتكون من اكسجين (التنفس واحتراق الوقود) – النيتروجين (يتحكم فى تأثير الاكسجين فى الاحتراق – يستخدمه النبات فى صنع البروتين ) – ثانى اكسيد الكربون فى البناء الضوئى للنبات

**1)-Earth's atmosphere**: Surrounding earth & appears like a white colour.

***Consists of**:

- Oxygen gas (21%): used in respiration& combustion of fuel.
- Nitrogen gas (78%): reduce the effect of oxygen in combustion & plants used it to from proteins.
- Carbon dioxide gas: it is used by plants to from food by photosynthesis process.



- اهمية الغلاف الجوى :كبر حجمه يساعد فى احتراق ملايين الشهب ويقلل من سرعة النيازك – الطقس والمناخ من رياح وامطار وسحب تحدث داخله – مناسب للحياة – وجود طبقة الاوزون التى تمتص الاشعة فوق البنفسجية الضارة

***Importance of atmosphere:**

- **The great expansion of atmosphere** Helps in burning million of meteors & reducing speed of large meteors.
- Weather & climate take place in it such as (wind motion-clouds formation-rains).
- It is suitable for life.
- It contains ozone layer which protects living organisms from harmful ultraviolet rays.

- الغلاف المائى نوعان : ماء مالح (97% من مساحة الارض – المحيطات والبحار)
- ماء عذب ( 3% - الانهار – البحيرات – الجليد عند القطبين)

## 2)-Earth's hydrosphere:

Two types

| salty water | fresh water |
|---|---|
| **It represents 97% of water area on earth.**<br>**-It exists in oceans& seas** | **It represents 3% of water area on earth.**<br>**-It exists in rivers, lakes, snow at two poles** |

- اهمية الماء للكائنات – يستخدمه النبات فى البناء الضوئى – هضم وامتصاص الطعام – تكوين الدم – ثبات حرارة الجسم - 50% من الكائنات تعيش فيه – ينظم حرارة الارض

***Importance of water to living organisms:**

- Used in photosynthesis process of plants.
- Used in digestion and absorption processes.
- Forming blood.
- Stabilizing body temperature.
- More than 50% of living organisms live in it.
- Organize the temperature of land.

- درجة حرارة الارض مناسبة (ليل ونهار) لوجود الارض فى الترتيب الثالث عن الشمس

## 3)-The suitable temperature:

Suitable temperature at day and night.

**Bec**. Earths position in third position from sun.



- الجاذبية : تسبب ثبات الكائنات والغلاف المائى والجوى على سطح الارض

## 4)-the gravity:

1-Steadfastness objects & living organisms on its surface.

2-keeps hydrosphere on its surface.

3-keeps atmosphere surrounding earth.

- ضغط جوى مناسب لاستمرار الحياة

## 5)-Suitable air pressure:

Earth characterized by suitable air pressure for life about 76 cm Hg.

**G.R Planet Earth is suitable for life:**

**Due to: - The presence of water and atmosphere containing oxygen gas which is needed for life - Its temperature is suitable for life.**
**Its atmospheric pressure and its gravity force are suitable.**

- التركيب الداخلى للارض – الجزء الداخلى للارض فى حالة منصهرة نتيجة درجة الحرارة العالية

## *The inner structure of earth:

### G.R The inner part of the Earth was in a molten form

**Due to the high temperature.**

- نتيجة دوران الارض حول الشمس وحول محورها والجاذبية – الفلزات الثقيلة الكثافة تتحرك الى مركز الارض والخفيفة تطفو – ذلك كون طبقات الارض

**As a result of the revolution of the Earth around the Sun and its axis and due to gravity:**

*The heaviest metals in density (iron and nickel) descended towards the center.
*The lightest components in density ascended.
This lead to the formation of a number of layers.

## The Earth (as the egg) consists of three layers. طبقات الارض

**We can summarize the Earth's layers from outside to inside in the following table:**

| Earth's layers | Earth's crust القشرة | The mantle الوشاح | The core اللب | |
|---|---|---|---|---|
| | | | Outer core | Inner core |
| Formation: | It is a relatively light outer layer. | It is a rocky layer. | It is a layer of molten metals | It is a solid in iron and nickel |
| Thickness: | Ranges between 8-50km | A bout 2885 km | About 2270 km | About 1216km. |

**G.R The Earth inner core is rich in iron and nickel**

Bec. Heavy metals move to centre by effect of gravity and rotation



# Lesson 3: Rocks and Minerals

- القشرة الارضية تتكون من التربة والقاعدة للتربة

*The crust consists of soil & soil basis.

- التربة : طبقة رقيقة غير متماسكة تغطى القشرة – مفككة – تتكون من معادن وماء هواء – بقايا كائنات - جذور

- **The soil:** It is a thin non- compacted layer which covers earth's crust

1-It is fragmented and loss.

2-It consists of a mixture of mineral substances, water, air, decayed organic materials& plant roots.

- القاعدة : الصخر : مواد صلبة طبيعية فى القشرة تتكون من معادن

- **The solid basis:**

It consists of different types of rocks.

- **Rock:** It is a natural solid material that exists in earth's crust and it is formed of one mineral or group.

- انواع الصخور : صخور نارية – رسوبية – متحولة

## Types of rocks

1- Igneous rocks. 2- Sedimentary rocks. 3- Metamorphic rocks.

الصخور النارية : المادة المنصهرة (الماجما) تملأ الفجوات والشقوق تحت الارض – عند خروجها من الارض تكون حمم بركانية – عندما تبرد تتصلب وتكون الصخور النارية

### 1-Igneons rocks:

We know the outer core consists of magma that fill some gaps and cracks & make volcanic flows that is known as (Lava).

When lava and magma cool& solidify the igneous rocks forms .

الماجما : مادة منصهرة سميكة تحت القشرة - الحمم : مادة منصهرة عندما تخرج من سطح الارض

***Magma:** It is a very hot thick molten material below earth's crust.

***Lava:** It is the magma (molten material) reaches to earth's surface.

الصخور النارية : تتكون من تصلب الماجما تحت الارض او الحمم البركانية فوق سطح الارض

***Igneous rocks:** They are rocks formed by solidification of magma under earth's crust or Lava on earth's surface.

انواع الصخور النارية :

Types of Igneous rocks: **1) Plutonic rocks صخور جوفية**

**2) Surface (volcanic) rocks (سطحية) صخور بركانية**



| Plutonic rocks | Surface (volcanic) rocks |
|---|---|
| من تصلب الماجما – ذات بلورات كبيرة لان المعادن تأخذ وقت طويل للتصلب – ملمس خشن – مثل الجرانيت<br>**-The cooling of magma at depth of earth's crust slowly & their crystals are large-sized (G.R) bec. minerals of rocks take a long time to crystallize.**<br>**-They have coarse texture.**<br>**Example:**<br>**Granite:الجرانيت**<br>**- Color: pink or grey.**<br>**- minerals: seen by naked eye**<br>**- Heavy, rough, solid, cohesive متماسكة & it is not easily broken.**<br>**- Types of minerals: Quartz, feldspar& mica.**<br>**- found in: Eastern desert الصحراء الشرقية& Sinai peninsula.شبه جزيرة سيناء** | من تصلب الحمم ذات بلورات صغيرة لانها تأخذ وقت قليل للتصلب – ملمس ناعم – بها فتحات نتيجة اندفاع الغازات مثل البازلت<br>**-The cooling of lava on earth's surface quickly & their crystals are small sized (G.R).bec. minerals which formed rocks take short time to crystallize.**<br>**-They have smooth texture & contain small holes(due to pushing of gases in volcano)**<br>**Example: Basalt: البازلت**<br>**- dark colored**<br>**- Can't be seen by naked eye.**<br>**- Types of minerals: Olivine, feldspar, pyroxene.**<br>**- found in: Egypt in Abo-Zaabal, Abou rawash & El-Fayoum.** |

**الصخور الرسوبية تمثل 5% من حجم القشرة – 75% من الكتل الصلبة**

## 2-Sedimentary rocks: الصخور الرسوبية

They represent about 5% of total volume of earth's crust but covers about 75% of surface of earth's solid mass.

**تتكون الصخور الرسوبية ب 3 مراحل تآكل (تحلل وتفكك الصخور) – نقل بواسطة الماء – الترسيب (تتجمع طبقات)**

***Formation of sedimentary rocks:**

**1-Erosion** (fragmentation & disintegration) of sedimentary, Igneous& metamorphic rocks.

**2-Transportation:** The fragmented particles of rocks transport by water currents or by air.

**3-Sedimentation** (disposition): The particles of rocks deposited together forming sedimentary rocks.



**Lithification:** **التحجر: تجمع الطبقات يزيد الضغط وتقل نسبة المياه (الطبقات السفلى هى الاقدم)**

-When the weight of deposits layers increase above each other as increase the pressure, so the ratio of water existing between grains decrease.

-The layers in bottom are older& above ones are more recent

**الصخور الرسوبية: تتكون من تحلل وتفكك الصخور**

***Sedimentary rocks:**

They are rocks formed from the **fragments and decomposed** products of other rocks **or** they are rocks formed from cohesive of sediments **تماسك الرواسب**

**Example:** الحجر الرملى – الحجر الجيرى

| Sand stone | Lime stone |
|---|---|
| - Yellow colour.<br>- Coarse texture. خشن الملمس<br>- has shape of thin layer.<br>- forms from **minerals** are quartz, Feldspar & mica.<br>- Doesn't react with (HCL). | - White colour.<br>- Smooth texture. ناعم الملمس<br>- has shape of thin layer.<br>- Forms from mineral calcite (calcium carbonate).<br>- react with (HCL) & produces carbon dioxide gas. |

**الصخور المتحولة : تنشأ نتيجة تعرض الصخور للضغط او الحرارة**

**3-Metamorphic rocks:** **الصخور المتحولة**

They are rocks originated as a result of exposing the old rocks (Igneous or sedimentary) to factors of **pressure or high temperature** or both of them.

**Example:**

**Marble:** **الرخام**

-Its produced from **conversion of limestone**. من تحول الحجر الجيرى

-Its texture is coarse (rough). خشن

-Its color is white if pure نقى &other colures when it contains impurities. شوائب

-It has more solidity than lime stone.



# Lesson 4: Earthquakes and Volcanoes

مصر اقل تعرضا للزلازل – اسوأ زلزال 1992 – 5.9 ريختر تسبب فى اضرار وخسائر كبيرة
*Egypt is less exposed to earthquakes, and most of them are weak.

*The worst earthquake in Egypt in 1992, its intensity was 5.9 on Richter magnitude scale which cause a great harms & damages.

القاهرة اكثر المناطق خسائر – لانها قريبة من مركز الزلزال
***(G.R).**Cairo, El-Fayoum, Beni suef, Neweba& Dahab(Sinai peninsula)most damaged areas by earthquakes

bec. They were very closed to earthquake center.

الزلزال : هزات سريعة متتابعة للارض تحدث متتالية

## Earthquakes

They are rapid and successive shakes of ground which take place one after other.

اسباب حدوث الزلزال
***Causes of earthquakes occurrence:**

❶**Breaking of crust & formation of faults**: تحطم القشرة الارضية وتكون الفوالق

it is the direct cause of earthquakes. السبب المباشر للزلزال

الفالق : كسر فى القشرة يؤدى الى انزلاق الصخور فى اتجاه رأسى او افقى ع جانبى الكسر
-**Fault**: **الفالق** It is a fracture in earth's crust that leads to sliding of rocks in a vertical or horizontal direction on both sides of fracture.

1-fault with vertical displacement. 2-fault with horizontal displacement.

علل: وجود هزات مصاحبة للزلزال – عند حدوث الفالق تنطلق طاقة ع شكل امواج زلزالية تنتشر فى القشرة الارضية
**G.R Earth shaking takes place at occurrence of earthquake**

*Bec. When fault occurs, the energy is released **in** form of seismic waves which spread through the crust.

السبب الثانى للزلازل ثورة البركان – نتيجة حركة الماجما والغازات المحبوسة عند خروجها من البركان
❷**Volcanic eruption**: ثورة البركان

Due to movement of molten materials and trapped gases before and during their coming out of earth's surface

ليس كل البراكين تسبب زلازل
Not all volcanic activities are accompanied by earthquakes.



جهاز قياس شدة الزلزال – وقت الحدوث – مدة حدوثه

***Seismograph apparatus:**

Used to record earthquake intensity & time of earthquake occurrence and it is duration.

سجل الزلزال : خط متعرج نتيجة لحركة الزلزال

***Seismic record:** It is a zigzag line produced by earthquake recording.

***Earthquake intensity: شدة الزلزال**

مقياس ريختر : يقيس شدة الزلزال – مقسم الى 9 درجات

* **Richter magnitude scale** is used to measure the earthquake intensity & divided into 9 degrees:

1- Less than 3 Richter: felt by some animals only.يشعر به الحيوان فقط

2- From 3 to 4 Richter: weak shakes felt by people. ضعيف

3- From 4 to 5 Richter: intermediate shakes may cause slight damages اضرار طفيفة as destruction of weak buildings. تدمير المبانى الضعيفة

4- From 5 to 7 Richter: strong shakes causes great loses. هزات قوية تسبب اضرار كبيرة

5- More than 7 Richter: violent shakes **هزات عنيفة** causes occurrence of catastrophes **كوارث**

خطر الزلزال : فقد المبانى والارواح –تدمير الطرق السدود – حرائق – امواج هائلة (امواج تسونامى)

***Dangers (harms) of earthquakes:**

1-Great losses in spirits and buildings.

2-Roads blocking, Dams destroying & occurrence of great fires.

3-Extremely high waves in seas which destroy coastal cities **المدن الساحلية** , these waves called tsunami waves.

امواج تسونامى : امواج بحرية هائلة نتيجة الزلزال فى قاع البحر

**Tsunami waves:** They are marine waves of extremely high caused by earthquakes that take place in seas bottom.

فائدة الزلزال : معرفة التركيب الداخلى للارض – دراسة انعكاس الامواج البركانية

***Benefits of earthquakes**: It is possible to know the structure of Earth's inner layer & studying their seismic wave's reflection.



***Safety precautions إحتياطات الامان from earthquakes:**

**At time of earthquake occurrence: وقت حدوث الزلزال**

1-In building, sit under a hard table. الجلوس تحت منضدة

2-outdoors, you must go a wavy as far as from building. البعد عن المبانى

3-In car, you must remain inside. تبقى داخل السيارة

**-After earthquake occurrence: بعد حدوث الزلزال**

After earthquake occurrence, there are shakes called earthquake consequences from 12 to 24 hours.

توابع الزلزال هزات خطيرة تتبع الزلزال اقل فى الشدة

**-Earthquake consequences:** They are dangerous shakes that follow earthquake occurrence and they relatively less in strength.

1-Before go out of building, cut out electricity, gas & water. قطع الكهرباء

2-Don't enter buildings destroyed by earthquake. عدم دخول المبانى المتهدمة

3-Go to open places such as gardens or playground. اماكن مفتوحة

4-Try to follow broadcast. متابعة النشرة

البركان : فتحة فى القشرة تخرج منها الحمم البركانية و الغازات المحبوسة

# Volcano

It is an opening in earth's crust which permits the passage of molten materials (Lava) and trapped gases.

اسباب البركان : وجود جزء ضعيف فى القشرة حيث الماجما والغازات توجد تحت ضغط مرتفع

***Causes of volcano occurrence:**

Presence of weak parts in earth's crust, where molten magma contains gases under high pressure.

*** Parts of volcano:**

**1-Volcanic vent:** It is an opening lies at top of volcano. فوهة البركان

**2-Volcanic pipe or (neck):** It is a cylindrical cavity that connects Earth's interior with surface & magma go up through. عنق البركان : انبوب اسطوانى يوصل باطن الارض بالسطح

**3-Volcanic cone:** It is body of a volcano & consists of solidified molten materials accumulated around volcanic vent. جسم البركان



***Products of volcano:** نواتج البركان - المواد التى تخرج من البركان 1- مواد مفتتة – مجزأة

The materials ejected during volcanic eruption are:

1-**fragmented materials**: They are materials are different in size from big projectiles **مقذوفات كبيرة** to volcanic ashes **رماد بركاني**

2-**Lave** (lava flows): They are molten materials spread on volcanic sides

3-**Volcanic gases**: They are fused (mixed) gases such as water vapor and oxides of carbon, nitrogen and sulphur.

**اضرار البركان : انتشار الحمم يدمر مدن وقرى – انتشار الغازات السامة – حرائق الغابات – تدمير الزراعة**

***Harms of volcanoes:**

1-lava covers & destruct whole towns & villages.

2-The poisonous gases **غازات سامة**& volcanic dusts **الاتربة البركانية** spread and cover Large areas.

3-Fire catches forests.

4-destroying of cultivated lands.

**فوائد البراكين : انتاج الكهرباء – زيادة خصوبة التربة – تكوين جزر جديدة – انتاج صخور بركانية ذات قيمة اقتصادية**

***Benefits of volcanoes:**

1-Used in producing electricity from thermal energy that is produced from volcanoes.

2-Increase the fertility of soil.

3-Increase area of land, by forming new islands in seas.

4-They produce volcanic rocks with great economic values.

***Safety precautions from volcanoes: احتياطات الامان**

1-Neighbouring areas must be evacuated from people.**اخلاء المناطق المجاورة من الناس**

2-We must follow forecasting of wind direction to avoid poisonous gases.

**متابعة النشرة الجوية**

***There are thousands of volcanoes but, only sixty-one of them active**